

**Contract Documents and
Specifications for**

**VERAMENDI
LIFT STATION**

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SEALS PAGE

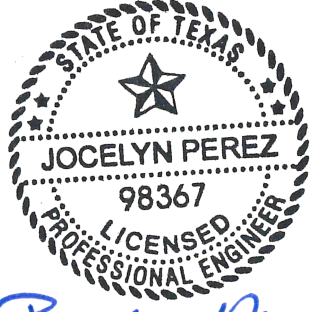
DIVISION	NAME	SEAL
1.01-2.07	Jocelyn Perez Pape-Dawson 1672 Independence Dr Suite 102 New Braunfels, TX 78132 Firm Registration Number: 12514 Texas Licensed Engineer: Jocelyn Perez Registration #98367	9/10/2025  <i>Jocelyn Perez</i>
2.08-2.09	Francisco Guerrero Pape-Dawson 10801 N. Mopac Expressway, Suite 200 Austin, Texas 78759 Firm Registration Number: 12514 Texas Licensed Engineer: Paco Guerrero Registration #85464	 <i>Francisco Guerrero</i> 9/10/2025

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INVITATION TO BID**PART 1 GENERAL****1.01 PROJECT IDENTIFICATION**

- A. Project Name: Veramendi Lift Station, located east of the Hueco Springs Loop Rd and River Road Intersection in New Braunfels, Texas.
- B. Project Number: 30001-71.
- C. The Owner, hereinafter referred to as Owner: Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement District No. 1F.
Sales Tax Exemption Number: 85-1263487.
- D. Owner's Representative: Pape-Dawson
Attn: Jocelyn Perez, P.E.
1672 Independence Drive, Suite 102
New Braunfels, TX 78132
O: (830) 632-5633
E: JPerez@pape-dawson.com

1.02 BID OPENING

- A. Bid Place
Sealed bids will be received in the office of the Engineer:
Project Name: Veramendi Lift Station
ATTENTION: Veramendi PE-Fremantle, LLC
c/o Pape-Dawson
1672 Independence Drive, Suite 102
New Braunfels, TX 78132
O: (830) 632-5633
- B. **Bid Due Date: September 18, 2025 by 3:00 PM local time.**
- C. Offers submitted after the above time will be returned to the bidder unopened.
- D. Submit required Supplements to Bid Forms with the bid documents.
- E. Offers will be publicly opened immediately after the time for receipt of bids.
- F. Amendments to the submitted offer will be permitted if received in writing prior to bid opening and if endorsed by the same party or parties who signed and sealed the offer.

1.03 REJECTION

- A. The Owner reserves the right to reject any and all Bids, and to waive any irregularities or discrepancies.

1.04 DELIVERY OF PROPOSALS

- A. It is the Bidder's responsibility to deliver the bid proposal at the proper time to the proper place. The mere fact that a bid proposal was dispatched will not be considered. The Bidder must have the bid proposal delivered as specified in 1.02.

1.05 TIME OF COMPLETION

- A. Each Bidder shall indicate on its bid the number of calendar days the bidder will require to complete the entire work under the Contract with all possible diligence within the time limit as stipulated in the bid proposal. The Owner considers it imperative that the work be

completed at the earliest possible date and consideration will be given to the proposed completion date in determining the Bidder to whom the Contract will be awarded.

END OF SECTION

INSTRUCTIONS TO BIDDERS**PART 1****1.01 PROJECT IDENTIFICATION**

- A. Project Name: Veramendi Lift Station located east of the Hueco Springs Loop Rd and River Road intersection in New Braunfels, Texas.
- B. Project Number: 30001-71.
- C. The Owner, hereinafter referred to as Owner:
Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement District No. 1F.
Sales Tax Exemption Number: 85-1263487
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O: (830) 632-5633
E: JPerez@pape-dawson.com

1.02 INTENT

- A. The intent of this Bid request is to obtain an offer to perform work to complete construction of site clearing & grading, sedimentation & erosion control, street, drainage, sewer and water improvements in New Braunfels, TX located east of the Hueco Springs Loop Rd and River Road intersection for a Stipulated Sum contract, in accordance with the Contract Documents.

1.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

- A. Work of this proposed Contract comprises as outlined above in 1.02, located in New Braunfels, Texas.

1.04 CONTRACT TIME

- A. Identify Contract Time in the Bid Form. The completion date in the Agreement shall be the Contract Time added to the commencement date.
- B. Owner requires that under the work of this contract be completed as quickly as possible and consideration will be given to time of completion when reviewing the submitted bids and awarding the contract.

PART 2**2.01 DEFINITIONS**

- A. Bid Documents: Contract Documents supplemented with Instructions to Bidders, Bid Form, Supplements To Bid Forms and Appendices identified.
- B. Bid, Offer, or Bidding: Act of submitting an offer under seal.
- C. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

2.02 CONTRACT DOCUMENTS IDENTIFICATION

- A. The Contract Documents are identified as Project Number 30001-71, as prepared by Pape-Dawson, who is located at 1672 Independence Drive, Suite 102, New Braunfels, TX 78132, and with contents as identified in the Table of Contents.

2.03 AVAILABILITY

- A. Complete sets of Bid Documents shall be used in preparing bids.
- B. Neither the Owner nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.
- C. **Bid Documents may be obtained in electronic format from the Developer. Please contact Troy Vater at troy.vater@asaproperties.us.com.**
- D. Subcontractors requiring Drawings and Project Manuals must obtain them from General Contractors.
- E. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

2.04 EXAMINATION

- A. Bidders shall carefully examine the Bid Documents and the Construction Site to familiarize themselves with existing local conditions under which the work is to be performed.
- B. Bidders shall carefully examine the Bid Documents to verify that they have a complete set of Bid Documents. Bidders are solely responsible for insuring their Bid Documents are complete and that they have considered all Addenda and other information published prior to the bid opening day.
- C. All Bidders and Sub-bidders acknowledge and agree that any information that they may have obtained from Owner or its Engineer relating to site conditions (including surface, sub-surfaces and existing structures, if any), availability of materials or labor, applicable statutes, ordinances, or regulations, and any other information not specifically provided for otherwise in the proposed Contract Documents, including Drawings and Specifications, shall be for general information purposes only, and Owner does not warrant or represent the accuracy, sufficiency or completeness thereof. All Bidders and Sub-bidders agree that they shall and, by submission of a bid, do warrant and represent that they have made their own independent investigation of such matters, have reached their own conclusion with respect thereto, and have relied completely on their own such investigations in connection with the preparation of their bid.
- D. Upon receipt of Bid Documents verify that documents are complete. Notify Engineer should the documents be incomplete.
- E. Immediately notify Engineer upon finding discrepancies or omissions in the Bid Documents.
- F. This job may require rock excavation. Any bid excluding rock excavation will be disqualified.

2.05 INQUIRIES/ADDENDA

- A. Bidders shall promptly notify the Engineer of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.
- B. **Submit all questions** regarding clarification or interpretation of Bid Documents to the office of the Engineer, Pape-Dawson, 1672 Independence Drive, Suite 102, New Braunfels, TX 78132, **Attn: Greg Latimer, P.E., Project Manager, E: glatimer@pape-dawson.com / P: (830) 632-5633.**
- C. Submit all questions in writing. In the interest of time, requests may be made by telephone, but they must be confirmed in writing the same day. Replies to questions will be issued to all known bidders in the form of an Addendum.

- D. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- E. Verbal answers are not binding on any party.
- F. Clarifications requested by bidders must be in writing **not less than five 5 days before date set for receipt of bids**. The reply will be in the form of an Addendum, a copy of which will be forwarded to known bidders.

2.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 5 days before receipt of bids.
- B. When a request to substitute a product is made, Engineer may approve the substitution and will issue an Addendum to known bidders.
- C. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the work and changes to Contract Time and Contract Price to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Price because of changes in work necessitated by use of substitutions shall not be considered.
- D. The submission shall provide sufficient information to determine acceptability of such products.
- E. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- F. Provide products as specified unless substitutions are submitted in this manner and accepted.

PART 3

3.01 SITE EXAMINATION

- A. Examine the project site before submitting a bid.
- B. **The bidder is required to contact Owner/Developer, ASA Properties, LLC, Attn: Troy Vater, P: (512) 797-8166 or E: troy.vater@asaproperties.us.com in order to arrange a date and time to visit the project site.**
- C. Extra payments will not be authorized for work that could have been foreseen by careful examination of the Site. Submission of a Bid shall constitute acceptance, by the Bidder, of existing Site conditions as a part of the requirements for this work.
- D. The Contractor shall have access to the premises during the bidding period for the purposes of acquainting himself with the conditions.
- E. The Contractor shall not enter or have access to the site in order to perform the work without first having given timely notice to the Owner so that the necessary arrangements may be made to enter or have access.

3.02 PREBID CONFERENCE

- A. A **bidders conference** has been **scheduled for 2:00 p.m. on the 8th day of September 2025 via teleconference** hosted by and from the Office of the Engineer, Pape-Dawson, located at 1672 Independence Drive, Suite 102, New Braunfels, TX 78132.
- B. Representatives of Engineer will be in attendance.

- C. No addendum will be issued at the pre-bid conference, but an addendum will be issued afterwards to Bid Document recipients, if necessary, to answer questions presented at the conference.

3.03 BASIS OF BIDS

- A. Bids shall be on a lump sum price basis and shall include all costs for this Project as described and shown by the Contract Documents. This total will be utilized in evaluating the bid for award. Basis for Bidding shall include brands, materials, processes, products, persons or organizations, etc., indicated in the Contract Documents.
- B. Bids shall include all Unit Price costs as indicated by the Contract Documents and Bid Form. The bid price submitted by the Contractor shall be a lump sum price. Unit prices are requested for the purposes of establishing costs for additional work and to evaluate the bids. The Contractor shall guarantee himself of the accuracy of the quantities shown in the bid form. Any quantities shown are estimates only and indicate only the magnitude of the project and a basis for bid comparison. Any discrepancies in quantity or work necessary to fulfill the intent of the plans shall be included, whether a bid item is included or not. Any work required for which a bid item is not shown shall be considered subsidiary to other work items.
- C. Contractor is to perform an independent quantity take-off prior to submitting the bid, to verify that any quantities given in the bid proposal are within five percent (5%) of the actual quantities required to complete the construction represented by the plans and specifications. If any quantity is found to be in error of more than five percent (5%), the Contractor shall notify the Engineer five days prior to the bid due date. This direction is not applicable to grading quantities as outlined in Item D below.
- D. The Engineer's grading plan and street profiles included in the construction documents shall represent finished grades of the proposed project. The Engineer shall provide topographic digital surfaces of both existing and proposed grades. The existing ground surface was produced using on-the-ground field shots. The Contractor is ultimately responsible for verifying the existing ground using whatever field surveying methods necessary prior to bidding. In addition, the contractor is solely responsible for the accuracy of the earthwork quantities (embankment, excavation, material import, and material export) in the contractor's submitted bid that are necessary to produce the finished grades. It shall be the intent of the contractor to finish the project to the finished grades included in the construction documents based on the earthwork quantities set forth in the contractor's submitted bid, and without importing additional material and without producing stockpiles of extra material except as directed by owner or engineer. Contractor shall not stockpile any material on owner's property without owner's approval. Any material handling outside of the contracted amount needed to produce the finished grades for the project (including, without limitation, material importing and material exporting) shall be deemed as non-pay items, and shall be performed by the contractor at the contractor's sole cost and expense.
- E. Bids shall include all Alternate costs as indicated by the Contract Documents and Bid Form.
- F. Economic Disincentive for Late Completion of Work: The CONTRACTOR and the OWNER agree that time is of the essence of this Contract. The CONTRACTOR and the OWNER agree that the Agreement is based on completion of the Work by CONTRACTOR in the time specified in the Agreement. CONTRACTOR and the OWNER agree that for each and every calendar day the work or any portion thereof shall remain uncompleted after the expiration of the time limit set in the Contract, or as extended under the provisions for Extension of Time in this Contract, CONTRACTOR shall be liable to OWNER for an economic disincentive in an amount specified in

the Special Conditions for such calendar day. The OWNER shall have the option to deduct and withhold said amount from any monies that the OWNER owes the CONTRACTOR or to recover such amount from the CONTRACTOR or the Sureties on the CONTRACTOR's bond.

- G. The Contractor undertakes and accepts that the contract documents are meant to include or imply all items required for the proper execution of the work. Any items mentioned in the specifications and not shown in the drawings, or the reverse, shall be provided as if shown or mentioned in both.

3.04 ALTERNATES

- A. The Owner may, at his option, elect to proceed with any or all Alternates as set forth in the Bidding Requirements.
- B. Amount shown on Bid Form for each Alternate shall include profit, insurance, contingencies and other costs incidental to performance under such Alternative.
- C. Amount shown on Bid Form for Each Alternate shall include the making of all changes and the installation of all materials and equipment necessary to the accomplishment of the Alternate requirements.
- D. Refer to the respective Section for complete Specifications of each Alternate.
- E. If an Alternate is accepted, it shall be included as part of the Contract Document.

3.05 VOLUNTARY ALTERNATES

- A. The Contractor shall submit a list of voluntary cost-saving alternates for consideration. The list shall be submitted along with the bid.
 - 1. Amount shown in Bid for each Alternate shall include profit, insurance contingencies and other costs incidental to performance under such Alternative.
 - 2. Amount shown in Bid for each Alternate shall include the making of all changes and the installation of all materials and equipment necessary to the accomplishment of the Alternate requirements.

3.06 UNIT PRICES

- A. Authorized work, done in addition to that indicated by the Contract Documents and Plans, will be paid for as an extra according to the Unit Price Schedule. Costs of authorized omissions of work from that indicated by the Contract Documents and Plans will be deducted from the Contract amount according to the Unit Price Schedule.
- B. Amounts shown on the Unit Price Schedule shall be total compensation; labor, materials, fees, taxes, profit, overhead and insurance and other expenses to be added or deducted from the Contract amount.
- C. Unit Price Schedule form is included with the Bid Form and shall be a part of the Agreement.

3.07 BIDS

- A. Bids shall be made on unaltered Bid Forms furnished by the Engineer. No oral, faxed, or voice mailed will be considered. Unit prices in Section 00 4100 1.09 shall be provided on attached bid sheet.
- B. Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.
- C. Any alteration or erasure to information entered in the blank spaces must be initialed by the signer of the Bid. Bidder shall make no additional stipulations on the bid form nor qualify his bid in any other manner.

- D. Where Bidder is a corporation, Bid must be signed with the legal name of the corporation followed by the name of the State of Incorporation and the legal signature of a person authorized to bind the corporation to a Contract.
- E. The bid must be accompanied by a sealed envelope marked "List of Subcontractors" containing a list of the names and addresses of all proposed subcontractors on the project.
- F. Upon submittal of his bid, each Bidder shall sign a statement declaring that he has received and understands each Addendum which might be prepared during the course of the bid process.
- G. Failure to submit a Bid in the form requested, or the inclusion of conditions, limitations or provisions distorting the intent of the Bid Documents, may render the Bid irregular and subject to rejection.
- H. An excel bid form may be provided as a convenience to the Bidder. The accuracy of the form, its formulas and the final amounts shall be the sole responsibility of the Bidder.

PART 4**4.01 EVIDENCE OF QUALIFICATIONS**

- A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position prior to relevant work experience, and license to perform work in the State.

4.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

- A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.
- B. Refer to General Conditions.

PART 5**5.01 SUBMISSION PROCEDURE**

- A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.
- B. Submit one copy of the executed offer on the Bid Form(s) provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
- C. If the Bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "BID ENCLOSED", ATTN: Mr. Garrett Mechler, Veramendi PE-Fremantle, LLC, PROJECT: Veramendi Lift Station, c/o Pape-Dawson, 1672 Independence Drive, Suite 102, New Braunfels, TX 78132.
- D. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

5.02 MODIFICATION OR WITHDRAWAL OF BID

- A. Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids.
- B. Prior to the time and date designated for receipt of Bids, Bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time designated for receipt of Bids.
- C. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these instructions to Bidders.

5.03 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.
- C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, invalidate the bid.
- D. Bids are open to the public.

5.04 CONSIDERATION OF BIDS

- A. Properly identified Bids received on time will be ***publicly opened on the 18th day of SEPTEMBER 2025 at 3:00 p.m.*** via teleconference hosted by and from the Office of the Engineer, Pape-Dawson Engineers, located at 1672 Independence Drive, Suite 102, New Braunfels, TX 78132.
- B. In determining the award of contract, the Owner may consider:
 - (1) the price
 - (2) the Bidder's construction schedule
 - (3) the Bidder's experience and reputation
 - (4) the quality of the Bidder's goods or services
 - (5) the Bidder's safety record
 - (6) the Bidder's proposed personnel
 - (7) whether the Bidder's financial capability is appropriate to the size and scope of the project
 - (8) Owner reserves the right to accept the bid that is most advantageous to the district as defined at Section 49.273 of the Texas Water Code.
- C. All bidders shall be completely responsive to these specifications; however, should the bidder, through his own experience, wish to make alternate suggestions regarding any phase of the scope, terms, procedures or frequencies, he may do so as an alternate and such suggestions must be in a separate letter enclosed with this bid.
- D. The Owner shall have the right to reject any or all Bids and in particular to reject a Bid not accompanied by any required bid security or data required by the Bid Documents or a Bid in any way incomplete or irregular.
- E. The Owner shall have the right to waive any informality or irregularity in any Bid received.
- F. If the Owner accepts any Alternates, he shall have the right to accept them in any order or combination.
- G. Award of Contract may include full consideration of completion time, unit prices and Alternates. Owner may accept or reject any or all Alternates.
- H. Owner shall have the right to make such inquiries as it seems appropriate to determine the ability of the Bidder to perform the work and the Bidder shall furnish Owner such information for this purpose as Owner may request. The right is reserved to reject any proposal where information submitted by such Bidder does not satisfy Owner that the Bidder is qualified to carry out properly the terms of the contract.

- I. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.
- J. The successful Bidder to whom the contract is awarded shall, within ten (10) days, execute the necessary bonds and sign the Agreement. Failure to do so will be considered abandonment of the bid.
- K. Prior to any work beginning Contractor must adhere to the following requirements:
 - 1. A fully executed Contract between Owner and Contractor.
 - 2. A Certificate of Insurance showing that the insurance requirements outlined herein have been met.
 - 3. All of the required bonds have been provided.
- L. All Bids will remain subject to acceptance for ninety (90) days after the day of the Bid opening, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to that date.

PART 6

6.01 SECURITY DEPOSIT

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. The Owner shall require a person who bids to submit a certified or cashier's check on a responsible bank in the state equal to at least five (5) percent of the total amount of the bid, or a bid bond of at least five (5) percent of the total amount of the bid issued by a surety legally authorized to do business in this state.
- B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
- C. Include the cost of bid security in the Bid Amount.

6.02 PERFORMANCE ASSURANCE

- A. Within seven (7) days of receipt from the Owner of the notice of award of the Agreement, the successful bidder shall submit to Engineer the original Performance Bond, Maintenance Bond, Payment Bond (the "Bonds") and all information necessary to complete the Contract Documents, including the Schedule of Completion and Contractor's safety program. Engineer shall then prepare the final Contract Documents and forward them to the successful bidder for execution. The successful bidder shall return the signed Contract Documents to Engineer within seven (7) days of receipt, or Owner may disqualify the bid and accept another bid and the bidder shall, at Owners option, forfeit its Bid Security and be responsible for any other damages the Owner sustains in excess of Bid Security

6.03 INSURANCE

- A. Contractor will carry insurance during performance of the Contract. Bidders shall state the limits of such insurances which they will carry and the names of the insurance carriers in the blank spaces provided in the proposal form.
- B. Contractor must provide Owner with evidence of the following minimum insurance requirements. In no way do these minimum requirements limit the liability assumed elsewhere in this Agreement.
 - 1. Workers' Compensation and Employer's Liability

- a. Statutory requirements in Texas to include all areas involved in operations covered under the contract.
 - b. Coverage "B" - Employer's Liability, Limit - \$500,000.
 - c. Must include Waiver of Subrogation rights against Owner.
2. Commercial General Liability
 - a. Commercial General Liability form, including Premises/ Operations, Independent Contractors, Products - Completed Operations, Broad Form Property Damage (including Completed Operations).
 - b. Contractual Liability, Blanket basis insuring the liability assumed under this contract.
 - c. Limits of Liability: Bodily Injury, \$1,000,000 each occurrence, \$2,000,000 aggregate; Products - Completed Operations, \$2,000,000 aggregate; Personal Injury, \$1,000,000 each occurrence, \$1,000,000 aggregate; and Property Damage, \$1,000,000 each occurrence, \$1,000,000 aggregate.
3. Commercial Automobile Liability
 - a. Commercial Automobile Liability form, including all Owned, Non-Owned and Hired Vehicles.
 - b. Limits of Liability: Bodily Injury, \$1,000,000 each person, \$1,000,000 each occurrence, Property Damage, \$1,000,000 each occurrence.
4. Umbrella Liability
 - a. Such insurance shall provide coverage with limits of not less than \$5,000,000 per occurrence, \$5,000,000 aggregate, in excess of the underlying coverages listed above.
5. Additional Requirements
 - a. Owner shall be included as an Additional Insured on all coverages listed above.
 - b. Contractor shall require the same minimum insurance requirements, as listed above, from its subcontractors and suppliers and they shall also comply with the additional requirements listed herein.
 - c. All insurance coverages required as herein set forth shall be at the sole cost and expense of contractor, subcontractor, or suppliers and all deductibles shall be assumed by, for the account of, and at the sole risk of said contractor, subcontractor or suppliers.
 - d. Except where prohibited by law, all insurance policies shall contain provisions that the insurance companies waive the rights of recovery of subrogation against Owner, its agents, servants, invitees, employees, co-lessees, co-venturers, affiliated companies and their insurers.
 - e. A Certificate of Insurance evidencing all the above must be presented to Owner prior to commencement of the Work.
 - f. The cancellation provision of such Certificate of Insurance shall provide as follows:
 - 1) "To be effective as to certificate holder, the issuing companies must provide to the below named certificate holder ten (10) days' written notice prior to any cancellation or material modification of the above referenced policies before the expiration dates thereof."

6.04 BID FORM REQUIREMENTS

- A. Complete all requested information in the Bid Form and Appendices.

6.05 SELECTION AND AWARD OF ALTERNATIVES

- A. Indicate variation of bid price for alternatives listed on the Bid Form. Unless otherwise indicated, indicate alternatives as a difference in bid price by adding to or deducting from the base bid price.
- B. Bids will be evaluated on the total of the base bid price and all of the Alternatives. After determination of the successful bidder, consideration will be given to which alternatives will be included in the Work.

PART 7**7.01 DURATION OF OFFER**

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the bid closing date.

7.02 ACCEPTANCE OF OFFER

- A. Owner reserves the right to accept or reject any or all offers.
- B. After acceptance by Owner, Owner will issue to the successful bidder, a written Notice of Award Contract letter. A written Notice to Proceed will be issued after the Agreement is fully executed as formal instructions from Owner to begin the work herein and define the commencement date of the Contract.

PART 8**8.01 CONTRACTOR DISCLOSURE**

- A. Effective January 1, 2006, Chapter 176 of the Texas Local Government Code ("Chapter 176") mandates the disclosure of certain items by contractors doing business with or proposing to do business with local government entities, including municipal utility districts, road utility districts, road improvement districts, levee improvement districts, drainage districts, water control and improvement districts, bayou improvement districts, regional water authorities, fresh water supply districts, management districts, tax increment reinvestment zones, development authorities, etc.

COMAL COUNTY WATER IMPROVEMENT DISTRICT NO. 1**BOARD OF DIRECTORS - 1A**

Donnie Shaw	President
Elizabeth Preston	Vice President
George Nevitt	Secretary
Bruce Bartlett	Assistant Secretary
Robert E. Whitley	Assistant Secretary

BOARD OF DIRECTORS - 1B

Cesar Merced Castilleja	President
Richard Thomas Carden	Vice President
Dean Ray Braune	
Ronald Edward Gonzales	Assistant Secretary
David Howard Sonnenberg	Assistant Secretary

BOARD OF DIRECTORS – 1D

Reyes Villarreal	President
Sandra Nicole Solte	Vice President
Spencer Gregory Brandt	Secretary
Lark Earnest Mason III	Assistant Secretary
Jolene Ellen Sutton	Assistant Secretary

BOARD OF DIRECTORS – 1F

Andrew T. Noonan	President
Steve L. Wigington	Vice President
Drew W. Snider	Secretary
David W. Compton	Assistant Secretary
Johnstuart Blythin	Assistant Secretary

- B. Certificate of Interested Parties” Texas Ethics Commission Form 1295: Effective January 1, 2016, pursuant to Texas Government Code § 2252.908 and Title 1, Chapter 46 of the Texas Administrative Code, the District may not execute the contract or issue the Notice to Proceed unless the Successful Bidder has previously filed Texas Ethics Commission Form 1295 (“Form 1295”) online at <https://www.ethics.state.tx.us/File/> with the Texas Ethics Commission (the “TEC”) and provided the District with a signed, notarized, and TEC certified copy of the filed Form 1295. The signed, notarized, and TEC-certified Form 1295 shall accompany the signed contract documents. **THE BIDDER UNDERSTANDS THAT FAILURE TO PROVIDE THE EC FORM 1295 COMPLETE WITH A “CERTIFICATE NUMBER” WILL NULLIFY THE CONTRACT AWARD AND WILL RELEASE THE OWNER FROM ANY LIABILITY TO PERFORM THEREUNDER. THE OWNER RESERVES THE RIGHT TO CANCEL ANY CONTRACT THAT DOES NOT COMPLY WITH THE REQUIREMENTS PRESCRIBED HEREIN.** Neither the District nor its consultants have any obligation to verify the truth or accuracy of the information provided by a business in Form 1295, and neither have any obligation nor undertake responsibility for advising any bidder with respect to the proper completion of Form 1295.

- C. The requirements of Subchapter J, Chapter 552, Government Code, may apply to this bid and contract and contractor agrees that the contract can be terminated if contractor knowingly or intentionally fails to comply with a requirement of that subchapter.

Contractor shall: (1) preserve all Contracting Information (defined below) in contractor's possession related to this contract as provided by the District's records control schedule (available upon request, also see <https://www.tsl.texas.gov/slrml/localretention>) for the duration of the Contract; (2) promptly provide to the District on the District's request any Contracting Information in contractor's custody or possession; and (3) on completion of the contract, either provide at no cost to the District all Contracting Information related to the contract in contractor's possession, or preserve such Contracting Information as provided by

the District's records control schedule. For purposes of this contract, Contracting Information means information related to the contract in contractor's custody or possession, including:

1. information in a voucher or the contract relating to the receipt or expenditure of public funds by the District;
2. solicitation or bid documents relating to the contract with the District;
3. communications sent between the District and contractor during the solicitation, evaluation, or negotiation of the contract;
4. documents, including bid tabulations, showing the criteria by which, the District evaluated contractor or potential contractors responding to a solicitation and, if applicable, an explanation of why contractor was selected; and
5. communications and other information sent between the District and contractor related to the performance of the contract or work performed thereunder on behalf of the District.

In submitting a bid, bidder and or contractor declares that it has not received from a governmental body a notice of noncompliance with a provision of Subchapter J, Chapter 552, Texas Government Code, or, if such a notice has been received, that bidder and or contractor has taken adequate steps to ensure future compliance with such subchapter and has provided or upon request will provide documentation of same.

NOTE: In the event there is a discrepancy between the Instructions to Bidders and the Contract Documents, the Contract Documents shall govern.

END OF SECTION

AVAILABLE PROJECT INFORMATION**PART 1 GENERAL****1.01 EXISTING CONDITIONS**

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders and is considered to be part of the Contract Documents, as follows:
- B. Geotechnical Report: Entitled Raba-Kistner Report ANA24-015-00, date June 21, 2024 and Supplemental Letter, date October 1, 2024.
 - 1. Original copy is available for inspection at Pape-Dawson Engineers, 1672 Independence Drive, Suite 102, New Braunfels, Texas 78132 during normal business hours.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of street pavement.
 - 3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

1.02 PERMITS

- A. The following permits will be obtained by the Owner, at no cost to the Contractor.
 - 1. Water Pollution Abatement Plan.
 - 2. Sewer Collection System.
- B. The following permits are known to be required and shall be obtained by the Contractor:
 - 1. The Contractor will be responsible for compliance with the Stormwater Pollution Prevention Plan and file as an Operator as required for coverage under State of Texas General Permit No. TXR 150000.
 - 2. The Contractor will be responsible for obtaining a Building Permit with the City of New Braunfels for all work.

END OF SECTION

BID FORM

THE PROJECT AND THE PARTIES

**1.01 TO: Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement
District No. 1F (OWNER)**

c/o Pape-Dawson Engineers
ATTN: GARRETT MECHLER
1672 Independence Drive, Suite 102
New Braunfels, TX 78132

1.02 FOR: Veramendi Lift Station**1.03 DATE: _____ (Bidder to enter date)****1.04 SUBMITTED BY: (Bidder to enter name and address)**

- A. Bidder's Full Name: _____
1. Address: _____
 2. City, State, Zip: _____
 3. The Undersigned proposes to furnish all labor, services, materials, tools and necessary equipment for the construction of various improvements and to perform the work required at the locations set out by the Plans and Specifications, in strict accordance with the Contract Documents.
 4. In submitting this Bid, it is understood that this Bid may not be altered or withdrawn for a minimum of ninety (90) calendar days, and that the Owner has reserved the right to reject any and all Bids.
 5. The Undersigned certifies that this Bid is made in good faith, without collusion or connection with any other person, persons, partnership, company, firm, association, or corporation offering Bids on this work, for the following sum or prices to wit:

1.05 DECLARATION

- A. The undersigned hereby declares that he has visited the site and has carefully examined the Drawings, Specifications, Contract Documents and Bid Documents related to the work covered by his Bid.

1.06 OFFER

- A. Having examined the limits of the project and all matters referred to in the Instructions to Bidders and the Contract Documents for the above mentioned project, we, the undersigned, hereby offer to enter into a contract to perform the work for the Unit Prices listed in this bid form of:

_____ dollars
(\$ _____), in lawful money of the United States of America.

- B. We have included the required Bid Security as required by the Instructions to Bidders.
- C. All applicable federal taxes are included and State of Texas taxes are included in the Bid Price.
- D. All Cash and Contingency Allowances described in Section 00 2100 are included in the Bid Price.

1.07 ACCEPTANCE

- A. This offer shall be open to acceptance and is irrevocable for ninety (90) days from the bid closing date.
- B. If this bid is accepted by Owner within the time period stated above, we will:
 - 1. Execute the Agreement within seven (7) days of receipt of Notice of Award or acceptance of this bid.
 - 2. Furnish the required bonds within seven (7) days of receipt of Notice of Award or acceptance of this bid.
 - 3. Commence work within seven (7) days after written Notice to Proceed or acceptance of this bid.
- C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), fail to execute the Agreement, or fail to provide proof that the required insurance has been obtained, then the security deposit shall be forfeited as damages to Owner by reason of our failure. In addition, bidder shall pay to the Owner any portion of the difference between this bid and the bid upon which a Contract is signed that is not covered by the Bid Security.
- D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.08 CONTRACT TIME

- A. If this Bid is accepted, we will substantially complete the work in [] calendar days and final completion in () calendar days from the Notice to Proceed or acceptance of this bid.

1.09 UNIT PRICES

- A. Unit Prices for specific portions of the Work are listed at the end of this section.

1.10 ADDENDA

- A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Price.
 - 1. Addendum # _____ Dated _____.
 - 2. Addendum # _____ Dated _____.
 - 3. Addendum # _____ Dated _____.

1.11 BID FORM SUPPLEMENTS

- A. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
 - 1. Document 00 4323 - Alternatives: Include the cost variations to the Bid Price applicable to the Work.
 - 2. Document 00 4336 - Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.
 - 3. Document 00 4100 - Bid Form - Unit Prices
- B. Bonds:
 - 1. Payment and performance bonds running to the Owner pursuant to Article 1.02, INSTRUCTION FOR BIDDERS.

- a. Premium: _____
- b. Name and Address of Surety:
 - 1) _____
 - 2) _____
- C. Insurance
 - 1. Insurance pursuant to Article 1.16, INSTRUCTION FOR BIDDERS (show normal coverage).
 - a. Workmen's Compensation Insurance complying with the laws of the state:
 - 1) Carrier: _____
 - b. Employer's Liability Insurance:
 - 1) Carrier: _____
 - 2) \$ _____
 - c. Comprehensive General Liability and Property Damage Insurance:
 - 1) Carrier: _____
 - 2) \$ _____
 - d. Comprehensive Automobile Liability and Property Damage Insurance:
 - 1) Carrier: _____
 - 2) \$ _____

1.12 BID FORM SIGNATURE(S)

The Corporate Seal of

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

(Authorized signing officer, Title)
(Seal)

(Authorized signing officer, Title)
(Seal)

END OF SECTION

VERAMENDI LIFT STATION

BID FORM

Date _____

BIDDER'S FULL NAME _____

Address _____

City, State, Zip _____

Milestone #1-Substantial Completion (days): _____ **BASE BID AMOUNT: #REF!** _____

Milestone #2-Final Completion (days): _____

1. The Undersigned proposes to furnish all labor, services, materials, tools and necessary equipment for the construction of various improvements and to perform the work required at the locations set out by the Plans and Specifications, in strict accordance with the Contract Documents.
2. In submitting this Bid, it is understood that this Bid may not be altered or withdrawn for a minimum of 90 calendar days, and that the Owner has reserved the right to reject any and all Bids.
3. The Undersigned certifies that this Bid is made in good faith, without collusion or connection with any other person, persons, partnership, company, firm, association, or corporation offering Bids on this work, for the following sum or prices to wit:

SIGNATURES _____

Authorized Signing Officer, Title

SIGNATURES _____

Authorized Signing Officer, Title

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
Lift Station Items					
1.	Trench Safety System, Complete in Place	LF	632	\$ -	\$ -
2.	Stripping and Site Preparation of Sparsely Vegetated Areas as Needed (Unusable Cleared Material to be Chipped and Hauled Offsite), As Directed by Engineer and	LS	1	\$ -	\$ -
3.	8 ft Diameter Precast Concrete Wet Well and Concrete Slab	EA	1	\$ -	\$ -
4.	Piping and Valving	LS	1	\$ -	\$ -
5.	Submersible Non-Clog Pumps	EA	2	\$ -	\$ -
6.	Electrical Service and Wiring with Pump Control Panel and SCADA	LS	1	\$ -	\$ -
7.	Electrical Panel Concrete Foundation Pad, Complete in Place	SF	144	\$ -	\$ -
8.	¾-Inch Freeze-Proof Potable Water Service with Hose Bib and Vacuum Breaker, Backflow Preventer and Meter, Complete in Place	EA	1	\$ -	\$ -
9.	Dewatering as needed for Installation of Wet Well, When Authorized by Owner, Complete in Place	LS	1	\$ -	\$ -
10.	6-Inch Plug Valve with Valve box, Complete in Place	EA	2	\$ -	\$ -
11.	City of New Braunfels Sanitary Sewer Precast Concrete Manhole w/ Drop Inlet (4-Foot Diameter), Complete in Place	EA	1	\$ -	\$ -
12.	8-Inch ASTM D3040 SDR 26 Polyvinyl Chloride (PVC) Wastewater Line with Tracer tape, All Depths, Complete in Place	LF	291	\$ -	\$ -
13.	10-Inch ASTM D3040 SDR 26 Polyvinyl Chloride (PVC) Wastewater Line with Tracer tape, All Depths, Complete in Place	LF	28	\$ -	\$ -
14.	1-Inch Water Line ASTM B88 Type K Annealed Seamless Copper Tubing, Complete in Place	LF	313	\$ -	\$ -
15.	8'-0" Fencecrete Fence, Complete in Place	LF	295	\$ -	\$ -
16.	Davit Crane and Manual Hoist	EA	1	\$ -	\$ -
17.	Emergency Generator and Pad, Complete in Place	LS	1	\$ -	\$ -
18.	20'-0" Automatic Sliding Facility Gate	EA	1	\$ -	\$ -
19.	6" Concrete Filled Removable Bollard, Complete in Place	EA	29	\$ -	\$ -
20.	6" Concrete Filled Bollard W/ D-Bolt Anchors, Complete in Place	EA	1	\$ -	\$ -
21.	Excavation	CY	184	\$ -	\$ -
22.	Gravel Access Road, 8" Flexible Base Material	SY	498	\$ -	\$ -

Subtotal \$ -

Force Main						
24.	Trench Safety System, Complete in Place	LF	781.5	\$	-	\$ -
25.	6-Inch AWWA C900 DR 25 Polyvinyl Chloride (PVC) Force Main, With Trace Tape, All Depths, Complete in Place	LF	781.5	\$	-	\$ -
					Subtotal	\$ -
Storm Water Pollution Prevention Plan Items						
26.	TPDES	LS	1	\$	-	\$ -
27.	Revegetation (Hydromulch)	SY	1,550	\$	-	\$ -
					Subtotal	\$ -
VERAMENDI LIFT STATION - CONTRACT AMOUNT:						\$ -

ALTERNATES FORM

PART 1 PARTICULARS

1.01 The following is the list of ALTERNATIVES referenced in the bid submitted by:

(Bidder): _____

To (Owner): Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement
District No. 1F

Dated: _____ and which is an integral part of the Bid Form.

PART 2 ALTERNATES LIST

2.01 Unit Prices for Alternates for specific portions of work are listed on the Bid Form at the end of Section 00 4100. The amounts shall be ADDED TO OR DEDUCTED FROM the Bid Amount.

END OF SECTION

PROPOSED SUBCONTRACTORS FORM

PART 1 PARTICULARS

1.01 Herewith is the list of proposed Subcontractors referenced in the bid submitted:

By (Bidder) _____

To (Owner): Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement District No. 1F.

Dated _____ and which is an integral part of the Bid Form.

1.02 The following work is proposed to be performed (or provided) by Subcontractors and coordinated by us:

LIST OF SUBCONTRACTORS

WORK SUBJECT	SUBCONTRACTOR NAME
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

END OF SECTION

AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

- A. The Agreement to be executed is attached following this page.

1.02 RELATED REQUIREMENTS

- A. Section 00 7200.10 - Conditions of the Contract (EJCDC C-700 "Standard General Conditions of the Construction Contract", 2018 Edition)
- B. Section 00 7300 - Supplementary Conditions (*Updated March 2022*)
- C. Section 00 7300.10 - Special Conditions (*Updated March 2022*)
- D. Section 01 4216 - Definitions.

PART 2 EXECUTION (NOT USED)

END OF SECTION

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 Laws and Regulations.

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

Prepared By



Endorsed By



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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
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1801 Alexander Bell Drive, Reston, VA 20191-4400
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GUIDELINES FOR USE OF EJCDC® C-520, AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

This Agreement form is specifically intended for stipulated price (fixed price) contracts—that is, contracts in which Owner and Contractor identify specific lump sums and unit prices as Contractor’s compensation for performing the Work. For construction contracts in which the Contract Price is primarily based on costs incurred during construction, users should select EJCDC® C-525, Agreement between Owner and Contractor for Construction Contract (Cost-Plus-Fee) (2018).

In construction contracting, as a general matter the “agreement” is the legal instrument executed (signed) by the project owner and the construction contractor, binding the parties to the terms of the contract. See CSI Project Delivery Practice Guide (2011), Section 11.1.2, p. 210, and CSI Construction Specification Practice Guide (2011), Section 5.1, p. 75. This EJCDC Agreement form serves that basic function, by identifying the parties and the Contract Documents, and establishing the Contract Price and Contract Times.

This Agreement form is drafted to be flexible enough to be used on projects that are competitively bid, and for public and private contracts that are negotiated or awarded through a proposal process or otherwise. On competitively bid projects, the following documentary information would typically be made available to bidders:

- Bidding Requirements, which include the Advertisement or invitation to bid, the Instructions to Bidders, and the Bid Form that is suggested or prescribed, all of which provide information and guidance for all Bidders, and Bid Form supplements (if any) such as Bid Bond and Qualifications Statement.
- Contract Documents, which include the Agreement, performance and payment bonds, the General Conditions, the Supplementary Conditions, the Drawings, and the Specifications.
- Documents referred to in the Supplementary Conditions or elsewhere as being of interest to bidders for reference purposes, but which are not Contract Documents.

Together, the Bidding Requirements and the Contract Documents are referred to as the Bidding Documents. (The terms “Bidding Documents,” “Bidding Requirements,” and “Contract Documents” are defined in Article 1 of the General Conditions.) The Bidding Requirements are not 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. Many contracts are awarded without even going through a bidding process, and thus have no Bidding Requirements, illustrating that the bidding items are typically superfluous to the formation of a binding and comprehensive construction contract. In some cases, however, a bid or proposal will contain numerous line items and their prices; in such case the actual bid or proposal document may be attached as an exhibit to the Agreement to avoid extensive rekeying.

2.0 OTHER DOCUMENTS

As noted above, before selecting C-520 for a specific project, confirm that the Contract will be based on lump sum (stipulated price) (which may include unit prices), and not on cost plus fee—for cost plus fee contracts, use C-525.

EJCDC documents are intended to be used as a system and changes in one EJCDC document may require a corresponding change in other documents. Other EJCDC documents may also serve as a reference to provide insight or guidance for the preparation of this document.

While preparing this document for use on a specific project, the user may decide to revise or supplement some of the standard provisions. When such changes are made, the user should review whether corresponding changes are needed in the following related EJCDC documents:

EJCDC Doc. No.	Document Title	Edition
C-200	Instructions to Bidders for Construction Contract	2018
C-410	Bid Form for Construction Contract	2018
C-700	Standard General Conditions of the Construction Contract	2018
C-800	Supplementary Conditions of the Construction Contract	2018

Other documents that provide additional information or guidance for the use of this document include the following:

EJCDC Doc. No.	Document Title	Edition
C-001	Commentary on the 2018 EJCDC Construction Documents	2018

3.0 ORGANIZATION OF INFORMATION

All parties involved in a construction project benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. Careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition) when preparing documents. EJCDC® N-122/AIA® A521 is available at no charge from the EJCDC website, www.ejcdc.org, and from the websites of EJCDC's sponsoring organizations.

If CSI MasterFormat™ is used for organizing the Project Manual, consult CSI MasterFormat™ for the appropriate document number (e.g., under 00 11 00, Advertisements and Invitations), and accordingly number the document and its pages.

4.0 GUIDANCE NOTES AND NOTES TO USER

EJCDC Documents include Guidance Notes and Notes to User to provide guidance regarding the preparation of Project specific documents. These notes are intended for use by the User in the preparation of the document and are not intended to be included in the completed document. Guidance Notes and Notes to User are lightly shaded to distinguish them from the proposed text of the Agreement. As a project-specific Agreement is prepared and made ready for issuance to bidders or execution by the parties, all shaded text (Guidance Notes and Notes to Users) should be deleted.

Guidance Notes provide information regarding the paragraphs which follow, including reasons for the paragraphs, discussions of best practices, and alternate approaches for different situations.

Notes to User provide specific information for editing the document. When alternate paragraphs for different situation are presented, explanations on how to select the most appropriate alternate will be provided, with direction to delete those paragraphs not used.

5.0 EDITING THIS DOCUMENT

5.1 It is intended that this document be edited for each Contract. Guidelines for editing include:

- A. Remove the cover pages which consist of the title pages and these Guidelines for Use.
- B. Type in required information as indicated by brackets ([]). Bracketed text will usually provide instructions for what is to be inserted in place of the brackets. Delete brackets and change formatting to match existing text after project specific text has been added, e.g. change “[Project Name]” to “Peach Street Renovation” (without brackets or bold, or quotation marks).
- C. Fill in blanks, if any. It will be more common for information to be inserted by user to be indicated by a prompt in brackets, as described in Paragraph B above, rather than by an underline-style blank.
- D. Most Notes to User are presented before the text to which they apply; some Notes to Users are interspersed in the text, usually within brackets. Delete all “Notes to User” after reviewing each note and taking appropriate action. Delete all associated numbering and brackets.
- E. Complete tables.
- F. Delete Guidance Notes.

6.0 LICENSE AGREEMENT

This document is subject to the terms and conditions of the **License Agreement, 2018 EJCDC® Construction Series Documents**. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC’s sponsoring organizations.

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **Veramendi PE-Fremantle, LLC on behalf of Comal County Water Improvement District No. 1F** (“Owner”) and _____ (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby 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 described as follows: *Construction of Site Clearing & Grading, Sedimentation & Erosion Control, and Sanitary Sewer Improvements.*

ARTICLE 2—THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: *Veramendi Lift Station, PD Project No. 30001-71.*

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained Pape-Dawson Engineers (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.
- 3.02 The part of the Project that pertains to the Work has been designed by Pape-Dawson Engineers (“Engineer”).

ARTICLE 4—CONTRACT TIMES

- 4.01 *Time is of the Essence*
- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.
- 4.02 *Contract Times: Days*
- A. The Work will be substantially complete within _____[number] days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within _____[number] days after the date when the Contract Times commence to run.
- 4.03 *Milestones*
- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
1. Milestone 1 – Substantial Completion

2. Milestone 2 – Final Completion

4.04 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. 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):
1. *Substantial Completion*: Contractor shall pay Owner \$1,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work*: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$1,000 for each day that expires after such time until the Work is completed and ready for final payment.
 3. *Milestones*: Contractor shall pay Owner \$1,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.
 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

4.05 *Special Damages*

- A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

- C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:
 - A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.
- 5.02 The total amount of the lump sum contract as reflected in the bid is _____ prior to any accepted alternates or change orders.

ARTICLE 6—PAYMENT PROCEDURES

- 6.01 *Submittal and Processing of Payments*
 - A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.
- 6.02 *Progress Payments; Retainage*
 - A. Owner shall make progress payments 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 Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. 90 percent of the value of the Work completed (with the balance being retainage).
 - b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- 6.03 *Final Payment*
 - A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.
- 6.04 *Consent of Surety*
 - A. Owner will not make final payment or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of twelve percent (12%) per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 - 1. This Agreement.
 - 2. Bonds:
 - a. Maintenance Bond
 - b. Performance bond (together with power of attorney).
 - c. Payment bond (together with power of attorney).
 - 3. Conditions of the Contract
 - 4. Supplementary Conditions
 - 5. Special Conditions
 - 6. Specifications as listed in the table of contents of the project manual (copy of list attached).
 - 6. Drawings listed on the attached sheet index.
 - 8. Addenda (numbers ___ to ___, inclusive).
 - 9. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid
 - 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
- B. The Contract Documents listed in Paragraph 7.01.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 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 8. 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.
 9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
 10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

{ Signatures on following page }

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

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

Owner:

***Veramendi PE-Fremantle, LLC on behalf of
Comal County Water Improvement District No. 1F***

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

c/o ASA Properties, LLC

P.O. Box 310699

New Braunfels, TX 78131

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

*(If Veramendi PE-Fremantle, LLC on behalf of Comal
County Water Improvement District No. 1 is a
corporation, attach evidence of authority to sign. If
Veramendi PE-Fremantle, LLC on behalf of Comal County
Water Improvement District No. 1 is a public body, attach
evidence of authority to sign and resolution or other
documents authorizing execution of this Agreement.)*

Contractor:

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

*(If _____ is a corporation, a partnership, or a
joint venture, attach evidence of authority to sign.)*

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

License No.:

(where applicable)

State:

PERFORMANCE BOND AND LABOR AND MATERIALS PAYMENT BOND**PART 1 GENERAL****1.01 PERFORMANCE BOND AND LABOR AND MATERIALS PAYMENT BOND**

- A. The Contractor shall, prior to the execution of the Contract, furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the amount of 100% of the Contract Sum covering 100% performance and 100% payment, and with such sureties secured through the Contractor's usual sources as may be agreeable to the parties.
- B. The Contractor shall deliver the required bonds to the Owner no later than the date of execution of the Contract, or if the Work is commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.
- C. The Contractor shall require the Attorney-In-Fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his Power of Attorney.
- D. Surety's Standard Performance Bond and Labor and Material Payment Bond, meeting requirements of the Hardeman Act, will be the forms used as Performance and Labor and Material Payment Bonds for this Project.

END OF SECTION

Project No. _____

PAYMENT BOND

TEXAS STATUTORY PAYMENT BOND

THE STATE OF TEXAS

§

§

KNOW ALL MEN BY THESE PRESENTS:

THE COUNTY OF _____

§

THAT WE, _____, as Principal, hereinafter called "Principal" and the other subscriber hereto _____, a corporation organized and existing under the laws of the State of _____, licensed to business in the State of Texas and admitted to write bonds, as Surety, herein after called "Surety", do hereby acknowledge ourselves to be held and firmly bound to the _____ "Owner", in the sum of _____ (\$_____) for payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns jointly and severally.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT:

WHEREAS, Principal has entered into a certain contract with Owner, dated the ____ day of _____, 200_, for _____, which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW THEREFORE, the condition of this obligation is such that if Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said contract, then, this obligation shall be null and void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of said Code to the same extent as if it were copied at length herein.

IN WITNESS THEREOF, the said Principal and Surety have signed and sealed this instrument on the respective dates written below their signatures.

ATTEST, SEAL: (if a corporation)
WITNESS: (if not a corporation)

(Name of Contractor)

By: _____
Name:
Title:

By: _____
Name:
Title:
Date:

ATTEST/WITNESS (SEAL)

(Full Name of Surety)

By: _____
Name:
Title:
Date:

(Address of Surety for Notice)

By: _____
Name:
Title:
Date:

PERFORMANCE BOND

THE STATE OF TEXAS

§

§

THE COUNTY OF _____

§

4850-2590-8498.v1

and save harmless Owner from any liability, loss, cost, expense (including attorneys fees), or damage arising out of or in connection with the work done by the Contractor under the Contract.

This bond and all obligations created hereunder shall be performable in _____ County, Texas. This bond is given in compliance with the provisions of Chapter 2253 of the Texas Government Code, as amended, which is incorporated herein by this reference. However, all of the express provisions hereof shall be applicable whether or not within the scope of said statute.

IN WITNESS THEREOF, the said Contractor and Surety have signed and sealed this instrument on the respective dates written below their signatures and have attached current Power of Attorney.

ATTEST, SEAL: (if a corporation)

WITNESS: (if not a corporation)

(Name of Contractor)

By: _____

Name:

Title:

By: _____

Name:

Title:

Date:

ATTEST/WITNESS (SEAL)

(Full Name of Surety)

By: _____

Name:

Title:

Date:

(Address of Surety for Notice)

By: _____

Name:

Title:

Date:

SPECIAL CONDITION TO THE AGREEMENT

Notwithstanding any other items, conditions or provisions of the general or special conditions or any other provision of the Contract Documents to the contrary, _____ (“District”) shall be deemed and considered as “Owner” for all purposes under the Contract Documents related to the work designated in the bid documents as “District Work”, and _____. (“Developer”) shall be considered the “Owner” for all purposes under the Contract Documents related to the work designated in the bid documents as “Developer Work”. After submission to and approval by District and by Developer of the invoices, certificates and supporting documentation in connection with a request for payment, Contractor agrees to and shall look solely to the District or Developer, as the case may be depending on whether the request arises under the Developer Work or District Work for payment of such invoices. **District shall have no obligation for payment of sums due or to become due for work designated as “Developer Work” and the Developer shall have no obligation for payment of sums due or to become due for work designated as “District Work.”**

For purposes of convenient administration of this Contract, District or Developer may from time to time make payments due Contractor pursuant to this Contract from funds advanced to District by Developer, or vice versa; provided, however, no such payment by either one will obligate them to make further payments due Contractor pursuant to this Contract.

The bonds that Contractor provides shall carry with them a dual obligee rider naming the Developer and District each as an obligee.

The undersigned CONTRACTOR agrees, covenants and represents that it will include this Special Condition to the Agreement in all of its subcontracts.

On Behalf of [OWNER]

On Behalf of [DEVELOPER]

On Behalf of [CONTRACTOR]

CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.01 GENERAL CONDITIONS

- A. The General Conditions of this Contract is the Engineers Joint Contract Documents Committee (EJCDC) Document C-700 "Standard General Conditions of the Construction Contract", 2018 Edition, hereinafter referred to as the "General Conditions" and is attached following this page.

END OF SECTION

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

- requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice 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.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *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, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *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.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *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 of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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 a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire 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; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, 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 exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the 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 is not intended to and 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 Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. 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 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means 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, means 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, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that 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 Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for 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;
 - 2. a preliminary Schedule of Submittals; 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.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, 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 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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 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 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 the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required 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.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will 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.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract 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, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. 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 had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); 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 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. 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 its consultants, including electronic media versions, or reuse any 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 adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract 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 Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *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.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 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 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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.

- 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 permanent improvements are to be made 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.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas 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 of 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

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

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 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 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, 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 fall within any one or more of the categories described in Paragraph 5.04.A;
 - 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 Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then 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 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. 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 Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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;
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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner 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. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. 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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. 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, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, 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.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is 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; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. 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 will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, 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, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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.
- C. All materials and equipment must 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.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether 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 other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, 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 specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to 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.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *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.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. 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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer 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).
- E. 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.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.15 *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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must 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 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, 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.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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, or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.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. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
- 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, 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.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 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 review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused 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.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 7.18.A will 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.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. 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 such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *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.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *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.

10.02 *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 10.07. 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.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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, will 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 Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in 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;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *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, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. 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, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will 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 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

- B. *Change Proposal Procedures*

- 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
- 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety 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), 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.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of 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, 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.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, 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 principal 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 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. 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.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 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 and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
1. the cash 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, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 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.
- B. 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. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. 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.
- D. 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- 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, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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, then 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 will 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.

14.07 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 defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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 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 14.07.

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

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement 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.
 - 2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing 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 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, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and 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:
 - a. 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; or
 - b. 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:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. 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 stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. 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; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, 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.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. 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 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *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, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* 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 have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written 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. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. 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.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and 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);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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.

- F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. 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. 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; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 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 16.03.
- B. 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, 7 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 are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract 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.

18.03 *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. 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.

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTARY CONDITIONS**PART 1 GENERAL****1.01 SUMMARY**

- A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200.10 - Conditions of the Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 RELATED SECTIONS

- A. Section 01 4216 - Definitions.

1.03 REFERENCE STANDARDS

- A. EJCDC C-800 - Guide to the Preparation of Supplementary Conditions; 2018.

1.04 MODIFICATIONS TO GENERAL CONDITIONS

- A. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2018 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect. To the extent of a conflict between the standard General Conditions and these Supplementary Conditions, these Supplementary Conditions Control.

SC-1.01 Add the following language to the end of Paragraph 1.01.A.42:

In any event, the Work will not be deemed substantially complete until such time as all of the following have occurred:

- 1) completed street paving
- 2) completed final lot grading, as applicable
- 3) completed installation of water and wastewater utilities
- 4) completed installation of contractor electric improvements,
- 5) completed installation of telecommunication
- 6) natural gas improvements

SC-2.01 Add the following language to the end of Paragraph 2.01.B:

In addition to additional insured requirements in the Supplementary Conditions, CONTRACTOR shall list the following as Additional Insureds for all required policies except Worker's Compensation.

Veramendi PE-Fremantle, LLC
Veramendi PE-Brisbane, LLC
Veramendi PE-Cairns, LLC
Veramendi PE-Darwin, LLC
Veramendi PE-Emerald, LLC
Veramendi Development Company, LLC
ASA Properties, LLC

CONTRACTOR shall obtain the Additional Insured endorsement form CG 2026 1185 or equivalent and shall state that the liability insurance is primary as to the additional insured.

- SC-2.03** Delete paragraph 2.03.A.2 in its entirety.
- SC-2.03** Delete paragraph 2.03.A.3 in its entirety.
- SC-2.05** Delete paragraph 2.05.A.3 in its entirety.
- SC-4.01** Delete paragraph 4.01 in its entirety and replace with the following language:
A. CONTRACTOR shall mobilize and begin Work in earnest within ten (10) days of the date indicated in the Notice to Proceed. Failure of CONTRACTOR to begin work in earnest decreases the ability of CONTRACTOR to complete in time and for OWNER to take possession. OWNER may assess \$1,000/day in damages for each day that CONTRACTOR fails to pursue the work. If CONTRACTOR completes on time, such amounts shall be refunded at Final Completion.
- SC-5.06** Delete Paragraph 5.06.I in its entirety.
- SC-5.06** Delete Paragraph 5.06.K in its entirety.
- SC-6.01** Add to the end of paragraph 6.01B the following language:
The surety company issuing Payment and Performance Bonds, and a Maintenance Bond (if so required by the Contract Documents), must (a) be authorized to do business in the State of Texas as evidenced by licensing through the Texas Department of Insurance; (b) be authorized to issue Payment and Performance Bonds, and Maintenance Bonds (if so required by the Contract Documents), in the amount required for the contract as indicated by the records of the Texas Department of Insurance; (c) for contracts over \$100,000.00, the surety must also hold a certificate of authority from the United States Secretary of Treasury to qualify as a surety or reinsurer on obligations permitted or required under federal law ("Certificate of Authority") or have obtained reinsurance for any liability in excess of \$100,000.00 from a reinsurer that is authorized and admitted as a reinsurer in the State of Texas and is the holder of a Certificate of Authority; and (d) have a rating of at least "A-" in the current Best's Key Rating Guide. The person executing the Bonds must be licensed as a Texas Local Recording Agent as required by the laws of the State of Texas and such licensing must be recorded.
- SC-6.01** Add the following language as new Paragraph 6.01.I of the General Conditions: Payment and Performance Bonds - Neither OWNER's receipt of non-compliant bonds or non-compliant insurance certificates nor OWNER's allowance of CONTRACTOR to proceed with the Work, shall be construed to relieve CONTRACTOR of its obligation to provide bonds and insurance according to the requirements of these CONTRACT DOCUMENTS. Additionally, failure to provide compliant bonds shall be a material breach justifying immediate termination for cause.
- SC-6.01** Add the following language as new Paragraph 6.01.J:
Maintenance Bond - CONTRACTOR shall supply a maintenance bond to the greater of (i) 10% of the total contract price or (ii) the amount required by the City of New Braunfels which shall remain in effect for two (2) years, the Guarantee Period.
- SC-6.02** Delete Paragraph 6.02.D of the General Conditions in its entirety.
- SC-6.03** The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:
Workers Compensation under 6.03.A
(1) State: Statutory

(2) Applicable Federal: Statutory

(3) Employers Liability: Accident \$1,000,000 each accident;

Disease \$1,000,000 each employee;

Disease \$1,000,000 policy limit

CONTRACTOR shall provide Waiver of Subrogation on Worker's Compensation to OWNER and ENGINEER.

Commercial General Liability Insurance under Paragraphs 6.03.C:

Commercial General Liability form, including Premises/ Operations, Independent Contractors, Products - Completed Operations, Broad Form Property Damage (including Completed Operations). Contractual Liability, Blanket basis insuring the liability assumed under this contract.

Limits of Liability: Bodily Injury, \$1,000,000 each occurrence, \$2,000,000 aggregate; Products - Completed Operations, \$2,000,000 aggregate; Personal Injury, \$1,000,000 each occurrence, \$1,000,000 aggregate; and Property Damage, \$1,000,000 each occurrence, \$1,000,000 aggregate.

Business Automobile Liability (including owned, non-owned and hired) under 6.03.D: Limits of Liability Bodily Injury: \$1,000,000, each person, \$1,000,000 each occurrence, Property damage, \$1,000,000 each occurrence.

Umbrella or excess liability under 6.03.E:

\$5,000,000 per occurrence; \$5,000,000 aggregate

SC-6.03 Add the following language to the end of Paragraph 6.03.A of the General Conditions:

"Workers' 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 Texas Workers' Compensation Commission (the "TWCC"), or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on 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 governmental entity.

Persons providing services on the project ("subcontractor" in Section 406.096 of the 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, owner-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 amount and filing of any coverage agreement, which meets the statutory requirements of Texas Labor Code, §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 OWNER prior to being awarded the contract.
- d. If the coverage period shown on the CONTRACTOR's current certificate of coverage ends during the duration of the project, the CONTRACTOR must, prior to the end of the coverage period, file a new certificate of coverage with the OWNER, showing that the coverage has been extended.
- e. The CONTRACTOR shall obtain from each person providing services on the project, and provide to the OWNER:
 - 1) a certificate of coverage, prior to that person beginning work on the project, so that the OWNER 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 on file for the duration of the project and for ten (10) years thereafter;
- g. The CONTRACTOR shall notify the OWNER 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 TWCC, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify current coverage and report failure to provide coverage.
- i. The CONTRACTOR shall contractually require each person with whom it contracts to provide service 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 §401.011(44) for all 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 the coverage period, 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 OWNER in writing by certified mail or personal delivery, within 10 days after the person knew or should known, of any change that materially affects the provision of coverage of any person providing service on the project; and
 - 7) contractually require each other person with whom it contracts to perform as required by paragraphs (1) - (7), with the certificate of coverage to be provided to the person for whom they are providing services.
 - 8) Contractor agrees to maintain Products- Completed Operations coverage with respect to "Bodily Injury" and "Property Damage" caused, in whole or part, by Contractor's work at the Project for a period of 10 years after final completion of the construction of the Project.
- j. By signing this contract or providing or causing to be provided a certificate of coverage, the CONTRACTOR is representing to the OWNER that all employees of the CONTRACTOR who will provide services on 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 the appropriate insurance carrier or, in the case of a self-insured, with the TWCC'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 OWNER to declare the contract void if the CONTRACTOR does not remedy the breach within ten days after receipt of notice of breach from the OWNER."
- SC-6.03** Add the following clause to the end of Paragraph 6.03.B of the General Conditions:
, provided that products and complete operations coverage shall be maintained through the expiration of the applicable statute of repose.
- SC-6.05** Delete 6.05 in its entirety.
- SC-6.06** Delete Paragraph 6.06.B in its entirety.
- SC-6.06** Delete Paragraph 6.06.C in its entirety.
- SC-7.02** Delete Paragraph 7.02.A and substitute the following in lieu thereof:
Contractor shall supervise and direct the Work, using the Contractor's best skill and attention, in a good and workmanlike manner and in the best and most expeditious and economical manner consistent with the interests of the Owner, shall exercise the

degree of care, skill and diligence in the performance of the Work in accordance with and consistent with industry standards for similar circumstances, shall utilize its best skill, efforts and judgment in furthering the interests of Owner, and shall furnish efficient business administration and supervision (the Contractor's "Standard of Care")."

SC-7.07 Add Paragraph 7.07.N as follows:

CONTRACTOR SHALL AT ITS COST INDEMNIFY, DEFEND, AND SAVE OWNER HARMLESS FROM ALL CLAIMS GROWING OUT OF THE DEMANDS OF PERSONS SUPPLYING LABOR AND/OR MATERIALS FOR THE WORK, AS THOSE TERMS ARE DEFINED IN CHAPTER 2253 OF THE TEXAS GOVERNMENT CODE. Contractor shall furnish satisfactory evidence that all obligations for labor and materials have been satisfied in the form of an Affidavit of Bills Paid as set forth in these Contract Documents. If Contractor fails to provide an affidavit as to any laborer or supplier, then Owner may, at Owner's option, pay directly any unpaid sums otherwise due to Contractor under this Contract or withhold from Contractor's unpaid compensation a sum of money deemed reasonably sufficient to liquidate any and all claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to Contractor shall be resumed in full in accordance with the terms of this Contract. In no event shall the provisions of this paragraph be construed to impose any obligation upon Owner by either Contractor or its Surety."

SC-7.08 Delete Paragraph 7.08 of the General Conditions in its entirety and insert the following in its place:

INTELLECTUAL PROPERTY RIGHTS AND INDEMNIFICATION

- 1) Contractor shall not furnish or provide to Owner any Materials or Work that infringes a third party's intellectual property rights (whether it be claims of improper use of confidential information, patent infringement, copyright infringement, or the like). Contractor shall not disclose or provide to Owner any information, ideas, concepts, improvements, discoveries, inventions, or forms of expression of ideas which Contractor does not own or otherwise have the right to disclose or provide to Owner.
- 2) Contractor represents and warrants that the Materials, the Work, all processes or methods utilized and all information, ideas, concepts improvements, discoveries, inventions or forms of expression of ideas disclosed shall be free from third party claims of ownership and that Owner's right to own, use, or otherwise disclose such Materials and Work shall be free from third party claims of infringement of intellectual property rights (whether it be claims of improper use of confidential information, patent infringement, copyright infringement, trademark infringement or the like)."
- 3) **CONTRACTOR SHALL DEFEND, PROTECT, INDEMNITY AND HOLD OWNER HARMLESS FROM AND AGAINST ALL LIABILITY, CLAIMS, DEMANDS AND CAUSES OF ACTION BROUGHT BY THIRD PARTIES (AND ALL COSTS, EXPENSES, DAMAGES, LIABILITIES, OR JUDGMENTS SUSTAINED OR INCURRED BY OWNER IN CONNECTION THEREWITH, INCLUDING THE COSTS OF INVESTIGATION AND REASONABLE ATTORNEYS FEES) ARISING OUT OF OR RELATING TO: (I) CONTRACTORS BREACH OF ANY REPRESENTATION OR WARRANTY, WHETHER EXPRESS OR IMPLIED, REGARDING INTELLECTUAL PROPERTY RIGHTS.**

SC-7.09 Add the following language as new Paragraph 7.09.B of the General Conditions:

The Construction Drawings and Special Specifications include a Storm Water Pollution Prevention Plan in accordance with TCEQ requirements. The Contractor shall be responsible for obtaining permit coverage under the TCEQ's Construction Storm Water General Permit for all phases of project construction, and shall be further responsible for all activities necessary to initially meet and thereafter continuously maintain strict compliance with such permit as well as all applicable rules of TCEQ relating to Storm Water discharges (including, but not limited to, implementing the best management practices set forth in the Storm Water Pollution Prevention Plan for this project."

- SC-7.10** Add the following language at the end of Paragraph 7.10 of the General Conditions: Owner is exempt from Texas sales and use taxes pursuant to Texas Tax Code § 151.309 as a political subdivision of the State of Texas. Owner shall provide Contractor with a completed Texas Sales and Use Tax Exemption Certification as evidence of the applicability of such exemption and, accordingly, Contractor shall not collect Texas sales and use taxes from Owner with respect to this contract. Contractor and all subcontractors to Contractor shall issue a Texas Sales and Use Tax Exemption Certification with respect to, and shall not pay Texas sales and use taxes on, all purchases of the following items that are exempt from Texas sales and use taxes pursuant to Texas Tax Code § 151.311: (i) tangible personal property that will be incorporated into Owner's realty; (ii) tangible personal property that is necessary and essential for the performance of this contract and is consumed entirely on the job site; and (iii) taxable services for use in the performance of this contract that are performed at the job site and are either integral to the performance of this contract or expressly required to be provided by this contract. In addition, Contractor and all subcontractors to Contractor (i) shall not include any provision for Texas sales and use taxes with respect to such exempt items in any bid or contract amount, and (ii) shall pass on to the Owner cost savings due to the exempt status of such exempt items. Contractor's contracts with all subcontractors to Contractor shall include the foregoing provision regarding the exemption from Texas Sales and use taxes.

Contractor shall pay, when due, all taxes, fees, and contributions imposed by reason of prosecution of the Work **AND SHALL PROTECT, INDEMNIFY, AND HOLD OWNER HARMLESS FROM LIABILITY RESULTING FROM FAILURE TO MAKE TIMELY PAYMENT OF THESE AMOUNTS AND COMPLY WITH THE REPORTING, FILING, OR OTHER PROCEDURAL REQUIREMENTS WITH RESPECT TO PAYMENT.** Interest, penalties, or other liabilities arising from failure to make payments shall not be reimbursed to Contractor."

- SC-7.11** Add the following language as new Paragraph 7.11.D of the General Conditions: Chapter 2258 of the Texas Government Code provides that any political subdivision of the State of Texas shall ascertain the general prevailing wage rate received by the classes of workers employed on projects similar to this project and shall specify in the call for bids and in the Contract the minimum wage rates which shall be paid for each type of worker. This statute further provides that the Contractor or Subcontractors shall pay, as a penalty, to the Owner Sixty Dollars (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the Contract. The Owner is authorized to withhold from the Contractor the amount of this penalty from any payment due under the Contract.

The statute likewise requires that the Contractor and subcontractors keep an accurate record of the names and occupations of all persons employed by them in the construction of the Project and to show the actual per diem wages paid to each worker. These records are open to the inspection of the Owner. The Prevailing Wage Rate Scale that applies to this Contract is attached in the Invitation to Bidders."

SC-7.11 Add Paragraph 7.11.E as follows:

Contractor shall at all times observe and comply with federal, state, and local laws, ordinances, and regulations which in any manner affect this Contract of the Work; **TO THE MAXIMUM EXTENT PERMITTED BY LAW INDEMNIFY AND SAVE OWNER HARMLESS AGAINST ANY CLAIM ARISING FROM VIOLATION OF ANY SUCH LAWS OR ORDINANCES WHETHER BY CONTRACTOR, ITS EMPLOYEES, AGENTS, PERMITTEES, OR LICENSEES;** and notify Owner promptly upon discovery of any instance of failure to comply with applicable laws, ordinances, and regulations."

SC-7.18 Delete Paragraph 7.18 of the General Conditions in its entirety and insert the following language in its place:

To the maximum extent allowed by law, the Contractor shall indemnify and hold harmless the Owner, its board, directors, officers, employees and agents, Engineer and its consultants, directors, officers, agents and employees and Developer and its directors, officers, agents and employees (collectively, the "Indemnitees"), from and against any and all claims, demands, suits, causes of action, settlements, liabilities, costs, expenses, fines, and judgments (including, without limitation, reasonable and necessary court costs, experts' fees and attorney's fees) (collectively, "Losses"), whether arising in equity, at common law, or by statute, including without limitation the Texas Deceptive Trade Practices Act (as amended) or similar statute of other jurisdictions, or under the law of contracts, torts (including, without limitation, negligence and strict liability without regard to fault) or property, of every kind or character (including, without limitation, claims for property damage, personal injury (including without limitation emotional distress), and economic loss), arising in favor of or brought by any of the Contractor's employees, agents, Subcontractors Suppliers or representatives, or by any governmental agency or any other third party, based upon, in connection with, relating to or arising out of the Work, the Contractor's failure to comply with the Contract Documents, or the Contractor's actions or inactions under the Contract Documents, including without limitation any failure to pay taxes or failure to comply with any applicable law, and EVEN IF ANY SUCH LOSSES ARE DUE IN PART TO ANY INDEMNITEES' SOLE OR CONCURRENT NEGLIGENCE OR OTHER FAULT, BREACH OF CONTRACT OR WARRANTY, VIOLATION OF STATUTE, OR STRICT LIABILITY WITHOUT REGARD TO FAULT. TO THE EXTENT THIS INDEMNITY IS LIMITED BY TEXAS INSURANCE CODE Section 151.102, THEN THE LIMITATIONS OF SAID STATUTE SHALL BE INCORPORATED HEREIN SUCH THIS INDEMNITY PROVIDES THE MAXIMUM PERMISSIBLE INDEMNITY UNDER 151.102

The foregoing indemnification obligation shall apply regardless of the amount of insurance coverage held by the Contractor, including without limitation any such coverage under any worker's compensation act, disability act, or other act or law which would limit the amount or type of damages, compensation, or benefits payable by or for the Contractor, and shall not be limited by any insurance carried or provided by the Contractor in accordance with the Contract Documents or otherwise.

Contractor shall and does hereby waive all causes of action it has for, and releases and forever discharges the Indemnitees from, Losses for injuries (including death) to any person or damage to or destruction of any property sustained or alleged to have been sustained in connection with or arising out of or incidental to the Work.

Contractor shall promptly settle or cause the settlement of all Losses for which it is responsible pursuant to the Contract Documents. Upon becoming aware of facts which may constitute any Loss, Contractor shall immediately notify the Owner of the full particulars thereof, and the Owner may elect, by notice to Contractor, to have its representative accompany Contractor's representative in making settlement of the same.

Contractor agrees and covenants that it will not contest the validity or enforceability of any indemnity or exculpatory provision of this Contract on the basis that it has no notice or knowledge of any such provision or that any such provision is not "conspicuous."

Other provisions in the Contract Documents containing indemnities shall be deemed to be cumulative of and to operate independently of the indemnities provided above such that all indemnities provided in the Contract Documents shall be construed to grant indemnity to the Indemnitees to the fullest extent possible."

SC-7.18 Add the following language as new Paragraph 7.18.C to the General Conditions: CONTRACTOR'S indemnification obligations shall include indemnification of all entities as:

Veramendi PE-Fremantle, LLC
Veramendi PE-Brisbane, LLC
Veramendi PE-Cairns, LLC
Veramendi PE-Darwin, LLC
Veramendi PE-Emerald, LLC
Veramendi Development Company, LLC
ASA Properties, LLC

SC-15.06 Add the following language as new Paragraph 15.06.A 2.f of the General Conditions: New Braunfels Utilities Acceptance Letter.

SC.15.06 Add the following language as new Paragraph 15.06.A.2.G. of the General Conditions: City of New Braunfels Acceptance Letter.

B. Standard General Conditions 5.02, 7.01, 7.02, 7.03, 7.07, 7.10, and 7.18 and/or Supplementary Conditions shall be modified by adding the following:

CONTRACTOR'S indemnification obligations shall include indemnification of all entities as:

Veramendi PE-Fremantle, LLC
Veramendi PE-Brisbane, LLC
Veramendi PE-Cairns, LLC
Veramendi PE-Darwin, LLC
Veramendi PE-Emerald, LLC
Veramendi Development Company, LLC
ASA Properties, LLC

END OF SUPPLEMENTARY CONDITIONS

SPECIAL CONDITIONS**PART 1 GENERAL****1.01 GENERAL**

- A. The Special Conditions modify, change, delete from or add to the General Conditions and shall apply to each and every Section of the Work as though written in full therein.
- B. The following paragraphs and subparagraphs take precedence over the General Conditions. Any part of the General Conditions not otherwise modified or deleted by the Special Conditions and/or the Supplemental Conditions, shall remain in effect.
- C. Paragraph numbers and titles refer to like numbers and titles in the General Conditions.

1.02 SPECIAL CONDITIONS

- A. It is the Developer's intent to award one (1) contract for Veramendi Precinct 30 Unit 2.
- B. Contractor is responsible for contractor registration fees and inspection fees by the City of New Braunfels. No separate line item.
- C. No construction activities shall be allowed outside the limits of construction as indicated on the Water Pollution Abatement Plan.
- D. The Owner is expecting the Contractor to deliver a complete construction project (in accordance with the plans). Any bid containing exclusions that are in conflict with these specifications or are considered to be unreasonable by the Engineer will result in a disqualification of the bid.
- E. Contractor is responsible for haul off or on-site embankment of trench spoils.
- F. This job may require rock excavation. Any bid excluding rock excavation will be disqualified.
- G. The project specifications, TPDES plan and WPAP shall be considered part of the construction documents and Contractor shall include in their bid all compliance with these documents.
- H. The Contractor shall provide a Phase 1 Environmental Site Assessment on any imported fill material prior to its use on the project site. The assessment must be performed by a qualified environmental professional and shall be provided to the Owner for review and approval prior to material being brought onto the Project. The Contractor is responsible for ensuring that all imported fill material is free from contamination and complies with applicable environmental regulations.
- I. Contractor shall be expected to revegetate all disturbed areas in accordance with the TPDES Plan for this project. Hydromulch should be placed in a manner consistent with manufacturer's specifications. Contractor shall irrigate all such areas until vegetation is established.
- J. Hydromulch shall be Texas Native Blend or as approved by the landscape architect or Owner and will include 2" Topsoil.
- K. Contractor shall protect all trees to remain as indicated on Veramendi Precinct 30 Unit 2 Grading Plan, Sheets C-2 & C-3 and the tree preservation plans by Coleman and Associates (included in bid) in accordance with tree protection details on Sheet C-14 of plans. In the event that the tree preservation plans differ from trees shown to remain on the aforementioned grading plan, the tree preservation plan will control.
- L. Contractor shall install and maintain, throughout the project, tree protection around all protected trees in accordance with plans.
- M. Contractor shall coordinate fine grading around all protected trees with the Owner.

- N. Reference Geotechnical Engineering Report for this project. Contractor shall include in their bid all compliance with this document.
- O. Contractor is responsible for scheduling dry utility precon meeting with Developer, Engineer, and NBU no less than sixty (60) days prior to electric install commencement.
- P. It is the Developer's intent to have all dry utilities installed prior to laying base. Contractor shall coordinate, including scheduling, with New Braunfels Utilities to allow for installation of utility services. Contractor shall install conduit for electric and NBU will install conductors. If dry utilities are installed subsequent to base, Contractor will be responsible for flowable fill backfill in the trench, at no additional cost.
- Q. All on-site testing shall be paid for by Owner. The Contractor will coordinate and schedule all testing as required. Any retesting or trip charges shall be paid for by Contractor.
- R. All excavation is unclassified.
- S. The Contractor shall prepare a well-coordinated bid, which includes all related work between subcontractors and incorporates all coordination of work. The Contractor shall assure all subcontractors have had access to the total bid package (drawings, specs, special conditions, etc.) to assure the bid and construction is fully coordinated.
- T. Contractor shall provide 2-year Maintenance Bond for proposed improvements per Section 01 7836.10.
- U. Contractor will provide partial lien releases in an amount equal to the percentage indicated on each pay application.
- V. With their submitted bid, Contractor shall provide the number of days for the following milestones. If milestone dates are not achieved, liquated damages may be assessed in accordance with the project contract.
 - 1. Milestone #1-Substantial Completion: Substantial completion of the project will be marked by the completion of the following items:
 - a. Completed access drive
 - b. Completed final grading
 - c. Completed installation of wet utilities
 - d. Completed installation of dry utilities
 - e. NBU acceptance
 - 2. Milestone #2-Final Completion: Final completion of the project will be marked by the completion of the following items:
 - a. City of New Braunfels acceptance
 - b. Delivery of properly filled out and executed all bills paid affidavit to the Owner
- W. The clearing quantity included in this bid includes clearing associated with Lift Station improvements.
- X. Any modification to existing fencing or gates shall be coordinated with Troy Vater with ASA Properties.
- Y. Contractor shall refer to NBU design sheets and details for installation of underground electric, fiber and communications infrastructure.
- Z. Contractor shall provide GPS points (x, y, and z) to the engineer for the following:

NBU AS-BUILT REQUIREMENTS:

NBU requires GPS points for wastewater improvements. Some of this information/data must be performed during construction, prior to backfilling operations. Contractor shall coordinate with NBU inspector to verify any additional items not shown below that need to be GPS located and the survey/delivery requirements regarding this information.

GPS points shall be required from the developer's contractor or engineer. A minimum of three coordinate points for georeferencing shall be required. The water and wastewater GPS points shall be to survey grade. The electric GPS points shall be to map grade.

Water

Vertical bends and edge of steel casing (if applicable) prior to backfill

Horizontal bends prior to backfill

Tees prior to backfill

Fittings (reducers and couplings) prior to backfill

Fire hydrants (top of flange)

Valves

Meters (top center of box)

Blow off assembly

Corner slab of water tank & gate valve on tank

Wastewater

Manholes (and invert depth(s))

Cleanouts

Corner slab of lift station

Electric

Poles

Transformers, both above and underground (front lock)

Pull boxes

Street lights

NOTE: See NBU's "CAD/GPS deliverables" on NBU website at nbutexas.com for complete details and requirements.

1.03 BURN

Burning of trash, organic material, or construction-related material shall be allowed if Contractor confirms burning is allowed by the governing agency or political subdivision, and if Contractor has requested and received written authorization from the Owner and jurisdictional agencies prior to any burning. Any costs of burning, including damages, shall be at Contractor's sole expense. If Contractor hauls unsuitable material offsite for disposal, costs shall be considered incidental and included in the Unit Prices for the Work.

1.04 STORM WATER POLLUTION PREVENTION PLAN

CONTRACTOR is required to fully comply with all applicable requirements including without limitation TCEQ requirements.

1.05 DECLARATION REGARDING SUBCHAPTER J, CHAPTER 552, TEXAS GOVERNMENT CODE

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this bid and contract and contractor agrees that the contract can be terminated if contractor knowingly or intentionally fails to comply with a requirement of that subchapter

END OF SECTION

Prohibition on Boycotting Israel and Contracting with Terrorist Organizations Verification

This Verification is hereby incorporated into the terms of the contract by and between _[Owner]_____ and _[Contractor]_____ entered into this the ____ of _____, 2017.

1. _[Contractor]_____, in conjunction with the execution of the above referenced contract and in accordance with Chapter 2270 of the Texas Government Code, effective Sept. 1 2017, does hereby agree, confirm, and verify that it:
 - A. Does not Boycott Israel; and
 - B. Will not Boycott Israel during the term of the contract.

“Boycott Israel” has the meaning given to it in Chapter 808 of Subtitle A, Title 8 of the Texas Government Code. As of the effective date of the statute, the term means “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 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 make for ordinary business purposes.”

2. Contractor hereby certifies that it is not a entity that contracts with or provides supplies or services to a foreign terrorist organization, as defined by Section 2252.151(2), Texas Government Code, and has not been identified as a company known to have contracts with or provide supplies or services to a foreign terrorist organization as identified on a list prepared and maintained under Section 806.051, 807.051, or 2252.153, Texas Government Code.
3. Contractor hereby acknowledges and agrees that this verification is a material term of the contract and Owner is expressly relying on this verification in agreeing to enter into the contract with Contractor.
4. **TO THE MAXIMUM EXTENT PERMITTED BY LAW, CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS OWNER FROM ALL CLAIMS, CAUSES OF ACTION, LEGAL PROCEEDINGS, DAMAGES, COSTS, FEES AND EXPENSES ARISING OUT OF OR RELATED TO AN ACTUAL OR ALLEGED MISREPRESENTATION BY CONTRACTOR PROVIDED HEREUNDER.**

[Signatures on Following Page]

Prohibition on Boycotting Israel and Contracting with Terrorist Organizations
[Continued]

Contractor

State of Texas
County of _____

Before me, a notary public, on this day personally appeared _____, known to me to be the person whose name is subscribed to the foregoing document and, being by me first duly sworn, declared that the statements therein contained in Paragraph 1A and B and Paragraph 2 are true and correct.

(Personalized Seal)

Notary Public's Signature

Receipt and incorporation into the above referenced contract hereby agreed to and acknowledged by:

Owner

Developer as Owner for Purposes of Payment

DEVELOPER AS OWNER FOR PURPOSES OF PAYMENT. Notwithstanding any other items, conditions, or provisions of the general or special conditions or any other provisions of the Contract Documents to the contrary, **Comal County Water Improvement District No. 1F ('District')** shall be deemed and considered as Owner for all purposes under the Contract Documents, except that Veramendi PE-Fremantle, LLC ("Developer") shall be considered the "Owner" for purposes of making payments to the Contractor or to any other party pursuant to or in relation to the Contract Documents of all or any portion of the Contract Price and for paying all or any costs or damages that might ever be due, including any costs associated with any change orders to the Contract. The District and Developer shall each approve all of the invoices, certificates and supporting documentation in connection with a request for payment. The Contractor agrees to and shall look solely to Developer for payment of all invoices, change orders, or other sums or claims, of whatever nature, due or to become due under or related to the Contract, and the District shall never be responsible or liable to the Contractor or any other party for such payments. Developer agrees to make all payments due under the Contract in accordance with its terms and agrees to all conditions and provisions herein. Failure by Developer to make such payments to the Contractor shall constitute a default by Owner and shall entitle the Contractor to all rights and remedies arising under the Contract Documents for a default in payment of sums due the Contractor pursuant to the Contract Documents; provided, however, the District shall have no obligation for payment of sums due or to become due under the Contract including any damages and Contractor shall look solely to the Developer for any such payment.

Developer reserves the right to assign its obligations hereunder to District, subject to written acceptance thereof by the District (at District's sole option). A copy of any such assignment and the acceptance thereof by the District shall be provided to the Contractor and thereafter the District shall be obligated to make all payments thereafter becoming due to the Contractor pursuant to this Contract and the obligations of Developer contained in the first paragraph of these Special Conditions shall terminate.

For purposes of convenient administration of this Contract, District may require Developer to advance funds due from time to time in order to make payments due the Contractor pursuant to this Contract from such funds; provided, however, no such payment by District will obligate District to make further payments due the Contractor pursuant to this Contract unless and until District has accepted an assignment of Developer's obligations hereunder and a copy of the assignment and the District's acceptance is delivered to the Contractor, whereupon the District shall become liable for payment to the extent of the assignment.

If Owner breaches its obligations in any respect under the Contract, before exercising any remedy the Contractor shall give written notice to Developer and District at the addresses below specifying the breach and the steps necessary to cure the breach and Developer shall have the right and power, within thirty (30) days after receipt of such notice, to cure or cause the breach to be cured, if it so elects, before Contractor exercises any of its remedies under the Contract.

Veramendi PE-Fremantle, LLC
c/o ASA Properties, LLC
P.O. Box 310699
New Braunfels, TX 78131

The District, Developer and Contractor hereby acknowledge that these Special Conditions to the Agreement are accepted regarding the project described as VERAMENDI LIFT STATION.

Effective (Month) _____, 2024.

Veramendi PE-Fremantle, LLC on behalf of Comal County
Water Improvement District No. 1F

By: _____

Name: _____

Title: _____

Date: _____

(insert Contractor name)
Contractor

By: _____

Name: _____

Title: _____

Date: _____

PRICE AND PAYMENT PROCEDURES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Document 00 5200 - Agreement Form
- B. Document 00 7200.10 - Conditions of the Contract
- C. Document 00 7300 - Supplementary Conditions
- D. Document 00 7300.10 - Special Conditions
- E. Section 01 2100 - Allowances
- F. Section 01 2200 - Unit Prices
- G. Section 01 7800 - Closeout Submittals: Project record documents.
- H. Section 01 7000 - Execution and Closeout Requirements.

1.03 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Engineer for approval.
- B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization and bonds and insurance.
- D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Engineer for approval.
- C. **Forms filled out by hand will not be accepted.**
- D. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.

3. Scheduled Values.
 4. Previous Applications.
 5. Work in Place and Stored Materials under this Application.
 6. Authorized Change Orders.
 7. Total Completed and Stored to Date of Application.
 8. Percentage of Completion.
 9. Balance to Finish.
 10. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit a minimum of five (5) copies of each Application for Payment.
- I. Include the following with the application:
1. Transmittal letter.
 2. Construction progress schedule, revised and current.
 3. Current construction photographs, if required.
 4. Partial release of liens from major subcontractors and vendors.
 5. Any waivers.
 6. Project record documents, for review by Owner which will be returned to the Contractor.
 7. Affidavits attesting to off-site stored products.
- J. When Engineer requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Engineer will issue instructions directly to Contractor.
- C. For other required changes, Engineer will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within five (5) days.
- E. Contractor may propose a change by submitting a request for change to Engineer, describing the proposed change and its full effect on the work, with a statement describing the reason

for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Engineer.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Engineer without a quotation from Contractor, the amount will be determined by Engineer based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 7000.
 - 2. All plan of record drawings are provided.

3. All warranty documents are provided.
4. All owner's manuals are provided.
5. All as-built drawings for public improvements are provided.
6. All testing results are provided.
7. All observation records are provided.
8. The owner's punch list has been completed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

ALLOWANCES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Cash allowances.
- B. Contingency allowance.
- C. Inspecting and testing allowances.
- D. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS - NOT USED**1.03 CASH ALLOWANCES**

- A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts, less applicable taxes.
- B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.
- C. Engineer Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- D. Contractor Responsibilities:
 - 1. Assist Engineer in selection of products, suppliers, and installers.
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Differences in costs will be adjusted by Change Order.

1.04 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.05 INSPECTING AND TESTING ALLOWANCES

- A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.
- B. Payment Procedures:
 - 1. Submit one copy of the inspecting or testing firm's invoice with next application for payment.

- 2. Pay invoice on approval by Engineer.
- C. Differences in cost will be adjusted by Change Order.

1.06 ALLOWANCES SCHEDULE

- A. Section _____ - _____: Include the stipulated sum of \$_____ for purchase and delivery of _____.
- B. Section _____ - _____: Include the stipulated sum of \$_____ for purchase and delivery of _____.
- C. Section _____ - _____: Include the stipulated sum of \$_____ for purchase and delivery of _____.
- D. Section _____ - _____: Include the stipulated sum of \$_____ for purchase and delivery of _____.
- E. Section _____ - _____: Include the stipulated sum of \$_____ for installation of _____.
- F. Section _____ - _____: Include the stipulated sum of \$_____ for installation of _____.
- G. Section _____ - _____: Include the stipulated sum of \$_____ for installation of _____.
- H. Section _____ - _____: Include the stipulated sum of \$_____ for installation of _____.
- I. Contingency Allowance: Include the stipulated sum/price of \$_____ for use upon Owner's instructions.
- J. Inspecting and Testing Allowance: Include the sum of \$_____ for payment of inspecting services specified in Section 01 4000 - Quality Requirements.
- K. Soils Testing Allowance: Include the sum of \$_____ for testing compacted soils.
- L. Concrete Testing Allowance: Include the sum of \$_____ for testing concrete.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

UNIT PRICES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.
- C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities from the drawings.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement Devices:
 - 1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
 - 3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.
- E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- G. Measurement by Area: Measured by square dimension using mean length and width or radius.
- H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
- J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Engineer of any discrepancies.
- K. Contractor's Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Engineer, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 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 the transporting vehicle.
 - 4. Products placed beyond the 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.

1.06 DEFECT ASSESSMENT

- A. Replace 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 one of the following remedies:
 - 1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Engineer.
 - 2. The defective Work will be partially repaired to the instructions of the Engineer, and the unit price will be adjusted to a new unit price at the discretion of Engineer.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
- D. The authority of Owner to assess the defect and identify payment adjustment is final.

1.07 SCHEDULE OF UNIT PRICES

- A.
 - 1. Item: _____; Section _____.
 - 2. Item: _____; Section _____.
 - 3. Item: _____; Section _____.
 - 4. Item: _____; Section _____.
 - 5. Item: _____; Section _____.
 - 6. Item: _____; Section _____.
 - 7. Item: _____; Section _____.
 - 8. Item: _____; Section _____.
 - 9. Item: _____; Section _____.
 - 10. Item: _____; Section _____.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

ADMINISTRATIVE REQUIREMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Progress photographs.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Document 00 7200.10 - Conditions of the Contract.
- B. Document 00 7300 - Supplementary Conditions.
- C. Section 01 3216 - Construction Progress Schedule.
- D. Section 01 7000 - Execution and Closeout Requirements.
- E. Section 01 7800 - Closeout Submittals.

1.03 PROJECT COORDINATION

- A. Cooperate with the Project Manager in allocation of mobilization areas of site; for field offices and sheds, for site access, traffic, and parking facilities.
- B. During construction, coordinate use of site and facilities through the Project Manager.
- C. Comply with Project Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- D. Comply with instructions of the Project Manager for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Manager.
- F. Make the following types of submittals to Engineer through the Project Manager:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Closeout submittals.

11. Plan of record drawings.
12. As-built utility drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
 2. Contractor and Engineer are required to use this service.
 3. It is Contractor's responsibility to submit documents in PDF format.
 4. Subcontractors, suppliers, and Engineer's consultants will be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. **Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.**
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service will be paid by Owner.
- C. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- D. Submittal Service: The selected service is:
 1. Newforma ConstructEx: www.newforma.com/products/constructex/#sle.
- E. Training: One (1), one-hour, web-based training session will be arranged for all participants, with representatives of Engineer and Contractor participating; further training is the responsibility of the user of the service.
- F. Project Closeout: Engineer will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRE-CONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice of Award.
- B. Engineer will schedule a meeting after Notice of Award.
- C. Attendance Required:
 1. Owner.
 2. Engineer.
 3. Contractor.

- D. Contractor will schedule and administer a pre-construction meeting within 15 days after date of Notice to Proceed.
- E. Location: A central site, convenient for all parties, provided by Contractor.
- F. Attendance
 - 1. Owner's Representative.
 - 2. Engineer's Representative.
 - 3. Contractor's Superintendent.
 - 4. Others as appropriate.
- G. 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 the parties to Contract.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Scheduling activities of Subcontractors.
 - 9. Contractor's progress and schedule chart.
 - 10. Review of required submittals.
 - 11. Processing of applications for payment.
 - 12. Critical work sequencing.
 - 13. Equipment and supply deliveries.
 - 14. Storage areas, security housekeeping and Owner's needs.
- H. Record minutes and distribute copies within three (3) days after meeting to participants, with one (1) copy each to Engineer, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

- A. Contractor will schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Engineer.
 - 4. Special consultants.
 - 5. Contractor's superintendent.
 - 6. Major subcontractors.
 - 7. Architect.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements and occupancy prior to completion.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.

7. Schedules.
 8. Application for payment procedures.
 9. Procedures for testing.
 10. Procedures for maintaining record documents.
 11. Requirements for start-up of equipment.
 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within three (3) days after meeting to participants, with one (1) copy each to Engineer, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals 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. Record minutes and distribute copies within three days after meeting to participants, with one copy each to Engineer, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Refer to Section 01 3216.
- B. Within ten days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first sixty days of Work, with a general outline for remainder of Work.
- C. If preliminary schedule requires revision after review, submit revised schedule within five (5) days.
- D. Within five (5) days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.
- E. Within three (3) days after joint review, submit complete schedule.

- F. Submit updated schedule every fourteen days.

3.06 PROGRESS PHOTOGRAPHS

- A. Submit new photographs at least once a month, within three (3) days after exposure.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Owner.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.
 - 6. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions.
- G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with two (2) to three (3) photos per page, each photo labeled with file name; one PDF file per submittal.

3.07 COORDINATION DRAWINGS

- A. Provide information required by Project Manager for preparation of coordination drawings.
- B. Review drawings prior to submission to Engineer or Architect.

3.08 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
 - 5. Other, as required.
- B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES.

3.09 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. LEED submittals and reports.

3. Certificates.
4. Test reports.
5. Inspection reports.
6. Manufacturer's instructions.
7. Manufacturer's field reports.
8. Other types indicated.

B. Submit for Engineer's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:

1. Small Size Sheets, Not Larger Than 8-1/2 by 11 inches: Submit the number of copies that Contractor requires, plus one (1) copy that will be retained by Engineer.
2. Larger Sheets, Not Larger Than 36 x 48 inches: Submit the number of copies that Contractor requires, plus one (1) copy that will be retained by Engineer.

B. Documents for Information: Submit one (1) copy.

C. Documents for Project Closeout: Make one (1) reproduction of submittal originally reviewed. Submit two (2) extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one (1) of which will be retained by Engineer.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Transmit each submittal with approved form.

D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

- F. 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 in accordance with the requirements of the Work and Contract Documents.
- G. Deliver submittals to Engineer at business address.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.
- I. For each submittal for review, allow five days excluding delivery time to and from the Contractor.
- J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and Engineer review stamps.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

END OF SECTION

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**PART 1-GENERAL****1.01 SUBMITTALS**

- A. Submit two prints of all Shop Drawings until final acceptance. One print will be returned to the General Contractor after Engineer's review.
- B. Submit a minimum of four copies of all Product Data until final acceptance. Three copies of the Product Data will be returned to the General Contractor after Engineer's review.
- C. Submit a minimum of duplicates of all Samples. Additional samples may be required for specific items for coordination of finishes.
- D. Submit additional copies of Samples and Product Data as necessary for distribution to subcontractors. Contractor shall obtain and distribute required prints of Shop Drawings made from reviewed and stamped reproducible. Exact number of copies of Product Data, Samples and Shop Drawings to be submitted shall be established in the pre-construction conference.
- E. Contractor shall review and stamp with his approval all submittals. Any submittals which do not bear the Contractor's approval stamp shall be returned without review.
- F. Where printed materials describe more than one product or model, clearly identify which is to be furnished.
- G. Shop Drawings shall not be reproductions of Contract Documents.
- H. Contractor shall make any corrections noted on Engineer's reviewed copies of submittals and shall resubmit the required number of corrected copies of Shop Drawings and Product Data or new Samples.
- I. Each Shop Drawing, Sample and Product Data submittal shall be properly identified bearing the name and quality of the material, the manufacturer's name, the Contractor's name, the Subcontractor's name, the name of the Project and the date of submission, and referenced to the applicable Specification Section.
- J. Engineer's checking of Shop Drawings, Samples or Product Data which deviates from the Contract Documents does not authorize changes to the Contract Sum. Submit in writing at the time of submission any changes to the Contract Sum affected by such Shop Drawings, Samples or Product Data, otherwise, claim for extras will not be considered.
- K. Submit schedule of Shop Drawing and Sample Submittals within 15 days after notice to proceed.

END OF SECTION

PROJECT MEETINGS**PART 1 - GENERAL****1.01 PRE-CONSTRUCTION MEETING**

- A. Contractor will schedule and administer a pre-construction meeting within 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, provided by Contractor.
- C. Attendance
 - 1. Owner's Representative.
 - 2. Engineer's Representative.
 - 3. Contractor's Superintendent.
 - 4. Others as appropriate.
- D. Agenda
 - 1. Contractor's progress and schedule chart.
 - 2. Review of required submittals.
 - 3. Processing of applications for payment.
 - 4. Critical work sequencing.
 - 5. Equipment and supply deliveries.
 - 6. Storage areas, security housekeeping and Owner's needs.
 - 7. Record minutes and distribute copies within three days after meeting to participants, with one copy each to Engineer, Owner, participants, and those affected by decisions made.

1.02 PROGRESS MEETINGS

- A. Contractor shall schedule regular periodic meetings, as required.
- B. Hold called meetings as required by progress of the work.
- C. Attendance:
 - 1. Engineer's Representative.
 - 2. Suppliers as appropriate to the agenda.
 - 3. Others as appropriate.

END OF SECTION

CONSTRUCTION PROGRESS SCHEDULE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS -- NOT USED**1.03 REFERENCE STANDARDS**

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

1.04 SUBMITTALS

- A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule to the Owner and Engineer for approval, a practical work schedule, showing the order in which the Contractor proposes to carry on the work and the time at which the several salient features will be started and completed.
- B. If the schedule requires revision after review, submit revised schedule within 5 days.
- C. Submit updated schedule every 14 days.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.06 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Minimum Sheet Size: Multiples of 8-1/2 x 11 inches.
- C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules for each stage of Work.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Include conferences and meetings in schedule.

- G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.
- I. Indicate delivery dates for owner-furnished products and products identified under Allowances.
- J. Coordinate content with schedule of values.
- K. Provide legend for symbols and abbreviations used.
- L. Include a separate bar for each major portion of Work or operation.

3.03 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Owner at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 5 days.

3.04 UPDATING SCHEDULE

- 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.
- C. Update diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.05 DISTRIBUTION OF SCHEDULE

- A. 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 indicated in schedules.

END OF SECTION

DAILY CONSTRUCTION PROGRESS REPORT**PART 1 - GENERAL****1.01 CONTRACT**

- A. The Contractor shall submit to the Project Manager, Daily Reports, wherein the following data is provided relative to his Work and the Work of his Subcontractors:
 - 1. Location and description of work being performed.
 - 2. Problems, if any, encountered during the course of the day's work.
 - 3. Number of personnel on job for Contractor and each Subcontractor (broken down as to the number of journeymen, apprentices, etc.).
 - 4. Temperature and weather conditions.
 - 5. Discrepancies, if any, noted in Plans and Specifications.

END OF SECTION

CONSTRUCTION PHOTOGRAPHS**PART 1 - GENERAL****1.01 CONSTRUCTION PHOTOGRAPHS**

- A. Construction progress photographs shall be taken once a month with the time, direction of view and vantage points as directed by the Engineer.
- B. Photograph from locations to adequately illustrate the condition of construction and the state of the Project.
 - 1. At successive periods of photography, take at least one photograph from the same overall view as previously.
 - 2. Consult with Engineer at each period of photography for instructions concerning the views required.
- C. Three photographs shall be taken each month by a professional photographer and shall be 8" x 11", double weight paper, color glossy finish, sharp and clearly showing details.
- D. All photographs shall be identified on the back with Project name, date, location and view of vantage point.
- E. Furnish two prints of each photograph to the Engineer to accompany each Application for Payment.
- F. All negatives, scans and/or digital files shall be retained by the photographer until the completion of the Project, at which time they shall be delivered to the Owner and shall become the property of the Owner.

END OF SECTION

QUALITY REQUIREMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Quality assurance submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Document 00 3100 - Available Project Information.
- B. Document 00 7200.10 - Conditions of the Contract.
- C. Section 01 2100 - Allowances.
- D. Section 01 3000 - Administrative Requirements.
- E. Section 01 4216 - Definitions.

1.03 REFERENCE STANDARDS

- A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
- B. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
- C. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
- E. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- C. Design Data: Submit for Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Test Reports: After each test/inspection, promptly submit one copy of report to Architect, Contractor, Owner, and Engineer.
 - 1. Include:

- a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.
2. Test report submittals are for Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
 1. Submit report in duplicate within fourteen (14) days of observation to Engineer for information.
 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- H. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date specified in the individual specification sections, except where a specific date is established by applicable code.

- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing, inspection, and reporting. Any retesting required shall be paid for by Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing, inspection, and reporting required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 6. Perform additional tests and inspections required by Engineer.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' 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 as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations.
1. Observer subject to approval of Engineer.
 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

- A. Replace 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 an appropriate remedy or adjust payment.

END OF SECTION

DEFINITIONS**PART 1 - GENERAL****1.01 SUMMARY**

- A. References to standards, codes, Specifications, recommendations and regulations refer to the latest edition or printing prior to the date of issue of the Contract Documents.
- B. Applicable portions of standards listed that are not in conflict with Contract Documents are hereby made a part of the Specifications.
- C. Modifications or exceptions to Standards shall be considered as amendments and unmodified portions shall remain in full effect. In cases of discrepancies between standards, the more stringent requirements shall govern.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. Provide: To furnish and install.
- F. Supply: Same as Furnish.

1.03 ABBREVIATIONS AND NAMES

- A. The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Names are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:
 - 1. AA Aluminum Association
 - 2. AAMA American Architectural Manufacturers Association
 - 3. AAN American Association of Nurserymen
 - 4. AASHTO American Association of State Highway and Transportation Officials
 - 5. AATCC American Association of Textile Chemists and Colorists
 - 6. ACI American Concrete Institute
 - 7. ACIL American Council of Independent Laboratories
 - 8. ACPA American Concrete Pipe Association
 - 9. ADC Air Diffusion Council
 - 10. AFBMA Anti-Friction Bearing Manufacturers Association, Inc.
 - 11. AGA American Gas Association
 - 12. AHAM Association of Home Appliance Manufacturers
 - 13. AI Asphalt Institute
 - 14. AIA American Institute of Architects
 - 15. AIA American Insurance Association
 - 16. AISC American Institute of Steel Construction
 - 17. AISI American Iron and Steel Institute

18. AITC American Institute of Timber Construction
19. ALSC American Lumber Standards Committee
20. AMCA Air Movement and Control Association
21. ANSI American National Standards Institute
22. APA American Plywood Association
23. APA American Parquet Association
24. ARI Air Conditioning and Refrigeration Institute
25. ASC Adhesive and Sealant Council
26. ASCE American Society of Civil Engineers
27. ASHREA Architectural Society of Heating, Refrigerating and Air-Conditioning Engineers
28. ASME American Society of Mechanical Engineers
29. ASPE American Society of Plumbing Engineers
30. ASSE American Society of Sanitary Engineers
31. ASTM American Society for Testing and Materials
32. AWI Architectural Woodwork Institute
33. AWWPA American Wood-Preservers' Association
34. AWPB American Wood-Preservers Bureau
35. AWS American Welding Society
36. AWWA American Water Works Association
37. BHMA Builders Hardware Manufacturers Association
38. BIA Brick Institute of America
39. BIFMA Business and Institutional Furniture Manufacturer's Association
40. CBM Certified Ballast Manufacturers
41. CDA Copper Development Association
42. CE Corps of Engineers (U.S. Dept. of the Army)
43. CFFA Chemical Fabrics and Film Association, Inc.
44. CFR Code of Federal Regulations
45. CGA Compressed Gas Association
46. CISPI Cast Iron Soil Pipe Institute
47. CLFMI Chain Link Fence Manufacturer's Institute
48. CPSC Consumer Product Safety Commission
49. CRA California Redwood Association
50. CRI Carpet and Rug Institute
51. CRSI Concrete Reinforcing Steel Institute
52. CS Commercial Standard of NBS (U.S. Dept. of Commerce)
53. CTI Ceramic Tile Institute
54. DHI Door and Hardware Institute
55. DLPA Decorative Laminate Products Association
56. DOC Department of Commerce
57. DOT Department of Transportation
58. EIA Electronic Industries Association
59. EPA Environmental Protection Agency
60. FAA Federal Aviation Administration (U.S. Dept of Transportation)
61. FCC Federal Communications Commission
62. FCI Fluid Controls Institute
63. FGMA Flat Glass Marketing Association

64.	FHA	Federal Housing Administration (U.S. Dept. of HUD)
65.	FM	Factory Mutual System
66.	FS	Federal Specification (General Services Admin.)
67.	FTI	Facing Tile Institute
68.	GA	Gypsum Association
69.	GSA	General Services Administration
70.	HPMA	Hardwood Plywood Manufacturers Association
71.	IEEE	Institute of Electrical and Electronic Engineers, Inc.
72.	IESNA	Illuminating Engineering Society of North America
73.	IGCC	Insulating Glass Certification Council
74.	ILI	Indiana Limestone Institute of America
75.	IMIAC	International Masonry Industry All-Weather Council
76.	IRI	Industrial Risk Insurance
77.	ISA	Instrument Society of America
78.	MBMA	Metal Building Manufacturer's Association
79.	MCAA	Mechanical Contractors Association of America
80.	MIA	Marble Institute of America
81.	MIL	Military Standardization Documents (U.S. Dept. of Defense)
82.	ML/SFA	Metal Lath/Steel Framing Association
83.	MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
84.	NAAMM	National Association of Architectural Metal Manufacturers
85.	NBGQA	National Building Granite Quarries Association
86.	NBS	National Bureau of Standards (U.S. Dept. of Commerce)
87.	NCMA	National Concrete Masonry Association
88.	NCRPM	National Council on Radiation Protection and Measurement
89.	NEC	National Electrical Code (by NFPA)
90.	NECA	National Electrical Contractors Association
91.	NEII	National Elevator Industry, Inc.
92.	NEMA	National Electrical Manufacturers Association
93.	NFPA	National Fire Protection Association
94.	NFPA	National Forest Products Association
95.	NHLA	National Hardwood Lumber Association
96.	NKCA	National Kitchen Cabinet Association
97.	NOFMA	National Oak Flooring Manufacturers Association
98.	NPA	National Particleboard Association
99.	NPCA	National Paint and Coatings Association
100.	NRCA	National Roofing Contractors Association
101.	NRMCA	National Ready-Mix Concrete Association
102.	NSF	National Sanitation Foundation
103.	NSSEA	National School Supply and Equipment Association
104.	NTMA	National Terrazzo and Mosaic Association
105.	NWMA	National Woodwork Manufacturers Association
106.	OSHA	Occupational Safety Health Administration (U.S. Dept. of Labor)
107.	PCA	Portland Cement Association
108.	PCI	Prestressed Concrete Institute
109.	PDI	Plumbing and Drainage Institute

110. PEI	Porcelain Enamel Institute
111. PS	Product Standard of NBS (U.S. Dept. of Commerce)
112. RFCI	Resilient Floor Covering Institute
113. RIS	Redwood Inspection Service (Grading Rules)
114. SAMA	Scientific Apparatus Makers Association
115. SDI	Steel Deck Institute
116. SGCC	Safety Glazing Certification Council
117. SHLMA	Southern Hardwood Lumber Manufacturers Association
118. SIGMA	Sealed Insulating Glass Manufacturers Association
119. SJI	Steel Joist Institute
120. SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
121. SPIB	Southern Pine Inspection Bureau (Grading Rules)
122. SPIB	Southern Pine Inspection Bureau
123. SSPC	Steel Structures Painting Council
124. SWI	Steel Window Institute
125. TCA	Tile Council of America
126. TIMA	Thermal Insulation Manufacturers Association
127. TPI	Truss Plate Institute
128. TxDOT	Texas Department of Transportation
129. UBC	Uniform Building Code
130. UL	Underwriters Laboratories
131. USDA	United States Department of Agriculture
132. USPS	United States Postal Service
133. WCLIB	West Coast Lumber Inspection Bureau (Grading Rules)
134. WRI	Wire Reinforcement Institute
135. WSC	Water Systems Council
136. WSFI	Wood and Synthetic Flooring Institute
137. WWPA	Western Wood Products Association (Grading Rules)
138. WWPA	Woven Wire Products Association

1.04 GENERAL SPECIFICATION ABBREVIATIONS

A. Cubic Foot	cu. ft.
B. Degree	deg.
C. Diameter	dia.
D. Feet or Foot	ft.
E. Inch	in.
F. Inside Diameter	i.d.
G. Kips (1000 pounds)	K
H. Millimeter	mm
I. Ounce	oz.
J. Outside Diameter	o.d.
K. Pound	lb.
L. Pounds per Cubic Foot	pcf

- M. Pounds per Square Foot psf
- N. Pounds per Square Inch psi
- O. Square Foot sq. ft.
- P. Square Inch sq. in.

1.05 REFERENCE STANDARDS - GENERAL

- A. Publications of organizations and societies listed in individual Specification Sections shall be considered integral with Contract Documents to extent referenced.
- B. Publications are referred to in text by basic designation only with organizations and societies referenced by abbreviations.
- C. When standard is referenced to in individual Specification Section but is not listed in this Section by title and date, it shall be considered to be latest revision at date of Project Manual issuance.
- D. Make available at site, copies of referenced documents as Engineer or Owner may request.
- E. Following listings include full title and applicable revision date.

1.06 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
 - 1. 211.1-81 (Revised 1985), Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 - 2. 211.2-81, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
 - 3. 211.3-75 (Revised 1987), Standard Practice for Selecting Proportions for No-Slump Concrete.
 - 4. 301-84 (Revised 1987), Specification for Structural Concrete for Buildings.
 - 5. 304R-85, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 6. 306R-77 (Revised 1982), Hot Weather Concreting.
 - 7. 306R-78 (Revised 1983), Cold Weather Concreting.
 - 8. 308-81 (Revised 1986), Standard Practice for Curing Concrete.
 - 9. 309-72 (Revised 1982), Standard Practice for Consolidation of Concrete.
 - 10. 315-80, Details and Detailing of Reinforced Concrete (included in SP-66).
 - 11. 318-83 (Revised 1986), Building Code Requirements for Reinforced Concrete.
 - 12. 347-78 (Reapproved 1984), Recommended Practice for Concrete Formwork.
 - 13. SP-66, ACI Detailing Manual (1980 Edition).
- B. American Institute of Steel Construction (AISC):
 - 1. Code of Standard Practice for Steel Buildings and Bridges (with Commentary), September 1, 1976.
 - 2. Manual of Steel Construction, Eighth Edition.
 - 3. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings (with Commentary), November 1, 1978.
 - 4. Specification for Structural Joints Using ASTM A325 or A490 Bolts, April 26, 1978.
- C. American Society for Testing and Materials (ASTM)
 - 1. A 36-84a, Specification for Structural Steel.
 - 2. A 47-84, Specification for Ferritic Malleable Iron Castings.

3. A 53-84a, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
4. A 82-85, Specification for Steel Wire, Plain, for Concrete Reinforcement.
5. A 108-81, Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
6. A 116-81, Specification for Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
7. A 123-84, Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.
8. A 153-84, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
9. A 185-85, Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
10. A 242-87, Specification for High-Strength Low-Alloy Structural Steel.
11. A 307-86, Specification for Carbon Steel Bolts and Studs, 6000 psi Tensile Strength.
12. A 325-86a, Specification for High-Strength Bolts for Structural Steel Joints.
13. A 370-86a, Methods and Definitions for Mechanical Testing of Steel Products.
14. A 416-86, Specification for Steel Strand, Uncoated Seven-Wire Stress-Relieved for Prestressed Concrete.
15. A 421-80 (1985), Specification for Uncoated Stress-Relieved Wire for Prestressed Concrete.
16. A 446-85, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
17. A 475-85, Specification for Zinc-Coated Steel Wire Strand.
18. A 490-85, Specification for Heat-Treated, Steel Structural Bolts 150 KSI Tensile Strength.
19. A 500-84, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
20. A 501-84, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
21. A 514-87a, Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
22. A 525-83, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
23. A 572-84, Specification for High-Strength Low-Alloy Columbium-Vanadium Steel of Structural Quality.
24. A 576-81, Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
25. A 588-87, Specification for High-Strength Low-Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 in. Thick.
26. A 611-85, Specification for Steel, Sheet, Carbon, Cold-Rolled Structural Quality.
27. A 615-87, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
28. A 706-84a, Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
29. A 775-85, Specification for Epoxy-Coated Reinforcing Steel Bars.
30. A 633-85, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
31. C 31-85, Method for Making and Curing Concrete Test Specimens in the Field.
32. C 33-86, Specification for Concrete Aggregates.
33. C 39-86, Test for Compressive Strength of Cylindrical Concrete Specimens.
34. C 42-84a, Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
35. C 90-85, Specification for Hollow Load-Bearing Concrete Masonry Units.
36. C 91-86, Specification for Masonry Cement.

37. C 94-86, Specification for Ready-Mixed Concrete.
38. C 109-86, Test Method for Compressive Strength of Hydraulic Cement Mortars.
39. C 138-81, Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.
40. C 140-75 (1980), Method of Sampling and Testing Concrete Masonry Units.
41. C 143-78, Test Method for Slump of Portland Cement Concrete.
42. C 144-87, Specification for Aggregate for Masonry Mortar.
43. C 150-85a, Specification for Portland Cement.
44. C 171-69 (1986), Specification for Sheet Materials for Curing Concrete.
45. C 172-82, Method of Sampling Freshly Mixed Concrete.
46. C 173-78, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
47. C 190-85, Test Method for Tensile Strength of Hydraulic Cement Mortars.
48. C 207-79 (1984), Specification for Hydrated Lime for Masonry Purposes.
49. C 231-82, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
50. C 260-85, Specification for Air-Entraining Admixtures for Concrete.
51. C 270-86b, Specification for Mortar for Unit Masonry.
52. C 309-81, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
53. C 311-85, Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
54. C 330-87, Specification for Lightweight Aggregates for Structural Concrete.
55. C 404-87, Specification for Aggregates for Masonry Grout.
56. C 476-83, Specification for Grout for Reinforced and Non-reinforced Masonry.
57. C 494-86, Specification for Chemical Admixtures for Concrete.
58. C 567-85, Test Method for Unit Weight of Structural Lightweight Concrete.
59. C 595-86, Specification for Blended Hydraulic Cements.
60. C 618-85, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement.
61. C 780-80 (1985), Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
62. C 827-82, Test Method for Early Volume Change of Cementitious Mixtures.
63. C 938-80 (1985), Practice for Proportioning Grout Mixtures for Preplaced-Aggregate Concrete.
64. C 942-86, Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
65. C 989-85a, Specification for Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars.
66. D 98-80, Specification for Calcium Chloride.
67. D 994-71 (Reaffirmed 1982), Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
68. D 1751-83, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
69. D 1752-84, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
70. D 2092-86, Recommended Practices for Preparation of Zinc-Coated Galvanized Steel Surfaces for Painting.

71. D 2240-86, Test for Rubber Property - Durometer Hardness.
 72. D 3034, Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 73. E 164-81, Practice for Ultrasonic Contact Examination of Weldments.
 74. E 329-77 (1983), Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
 75. E 447-84, Test Methods for Compressive Strength of Masonry Prisms.
- D. American Welding Society (AWS):
1. A5.1-81, Specification for Carbon Steel Covered Arc-Welding Electrodes.
 2. A5.5-81, Specification for Low-Alloy Steel Covered Arc-Welding Electrodes.
 3. A5.17-80, Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc-Welding.
 4. A5.20-79, Specification for Carbon Steel Electrodes for Flux Cored Arc-Welding.
 5. B2.1-84, Welding Procedure and Performance Qualification.
 6. D1.1-86, Structural Welding Code - Steel.
 7. D1.3-81, Specification for Welding of Sheet Metal in Structures.
 8. D1.4-79, Structural Welding Code - Reinforcing Steel.
 9. QC-1-86, Standard for Qualification and Certification of Welding Inspectors.
- E. Prestressed Concrete Institute (PCI):
1. MNL 116-77, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.
 2. MNL 117-77, Manual for Quality Control of Plants and Production of Architectural Precast Concrete Products
- F. Steel Deck Institute (SDI):
1. Specification for Composite Steel Floor Deck, 1987.
 2. Specification for Non-Composite Steel Form Deck, 1987.
 3. Specification for Steel Roof Deck, 1987.
- G. Steel Joist Institute (SJI):
1. Recommended Code of Standard Practice for Steel Joists, November 4, 1985.
 2. Standard Specification for Joist Girders, November 4, 1985.
 3. Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series, November 4, 1985.
 4. Standard Specification for Open Web Steel Joists, K-Series, November 1, 1985.

END OF SECTION

TEMPORARY FACILITIES AND CONTROLS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 3553 - Security Procedures.
- B. Section 01 5100 - Temporary Utilities.
- C. Section 01 5213 - Field Offices and Sheds.
- D. Section 01 5500 - Vehicular Access and Parking.
- E. Section 01 5813 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES

- A. See Section 01 5100 for additional requirements.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Existing facilities may be used with Owner approval.
- D. New permanent facilities may be used with Owner approval.
- E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; T-1 line or faster.
 - 4. Email: Account/address reserved for project use.
 - 5. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.
 - 6. Facsimile Service: Fax-to-email software on personal computer.
 - 7. Project web site.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. New permanent facilities may not be used during construction operations.
- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- E. Traffic Controls: To be installed and maintained per State or local requirements..

1.07 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 SECURITY

- A. See Section 01 3553 for additional requirements.
- B. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- C. Coordinate security program with Owner.

1.09 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Existing on-site roads or public streets shall not be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- G. Existing parking areas may not be used for construction parking.
- H. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification sign of design, construction, and location approved by Owner.
- B. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment .
- B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.
- C. Locate offices a minimum distance of 50 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove temporary underground installations to a minimum depth of two (2) feet.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED**

END OF SECTION

TEMPORARY UTILITIES**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary Utilities: Electricity, water, sanitary sewer, and telecommunications.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 - Temporary Facilities and Controls.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from electric service purveyor.
- C. Complement existing power service capacity and characteristics as required.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- E. Provide main service disconnect and over-current protection at the meter .
- F. Permanent convenience receptacles may be utilized during construction.
- G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
- H. Comply with Federal, State and local codes and regulations and with utility company requirements.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Materials and equipment may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.
- B. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Each Contractor shall provide for his extension cords and any additional lighting that may be required to complete his work.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY TELEPHONE SERVICE

- A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of personnel and the Engineer.
- B. List telephone with information operator in the name of the Project and in the name of the Contractor.
- C. Pay all costs for installation, maintenance and removal, and service charges for local calls. Toll charges shall be paid by the party who places the call.

1.06 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.

- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
- D. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.
- E. Each Contractor shall provide his distribution hoses as required to complete his work.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain adequate temporary outside toilet facilities for use of persons working at the Site.
- B. Keep toilets clean and in sanitary condition. Provide toilet tissue in suitable holders. Comply with applicable legal and health requirements.
- C. Remove temporary toilets when construction is completed.
- D. Existing plumbing facilities shall not be used by construction personnel.

1.08 TEMPORARY FIRE PROTECTION

- A. Observe and enforce throughout the work during the whole period of construction all requirements of the local City Fire Marshal and Insurance Authorities to minimize the fire hazard during the progress of the work.
- B. Make connections to existing facilities, provide water for fire protection purposes; Contractor to pay costs of water used.
- C. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED**

END OF SECTION

FIELD OFFICES AND SHEDS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary field offices for use of Contractor.
- B. Maintenance and removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 - Temporary Facilities and Controls:
- B. Section 01 5500 - Vehicular Access and Parking.

1.03 USE OF EXISTING FACILITIES

- A. Existing facilities shall not be used for field offices unless otherwise indicated.

1.04 USE OF PERMANENT FACILITIES

- A. Permanent facilities shall not be used for field offices unless otherwise indicated.

PART 2 PRODUCTS**2.01 MATERIALS AND EQUIPMENT**

- A. Materials and Equipment: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.
- D. Exterior Materials: Weather resistant, finished in one color.
- E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
- F. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 Contractor OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Telephone: As specified in Section 01 5000.
- C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- D. Other Furnishings: Contractor's option.
- E. Sanitary Facilities: As specified in Section 01 5000.
- F. Drinking Fountain: Convenient access by workers.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- B. Parking: Gravel parking area near field office.
- C. Employee Residential Occupancy: Not allowed on Owner's property.

3.03 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

VEHICULAR ACCESS AND PARKING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Flag persons.
- G. Flares and lights.
- H. Haul routes.
- I. Traffic signs and signals.
- J. Maintenance.
- K. Removal, repair.
- L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

- A. Section 01 5713 - Temporary Erosion and Sediment Control.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and paving.

2.02 SIGNS, SIGNALS, AND DEVICES

- A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As required by local jurisdictions.
- B. Traffic Control Signals: As approved by local jurisdictions.
- C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.
- B. Contractor shall obtain all permits and comply with all state and local codes for onsite fuel storage.

3.02 ACCESS ROADS

- A. Use of existing on-site streets for construction traffic is not permitted.
- B. Tracked vehicles not allowed on paved areas.

- C. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
- D. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
- E. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.
- F. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- G. Provide and maintain access to fire hydrants and control valves free of obstructions.

3.03 PARKING

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.
- B. Use of new parking facilities by construction personnel is not permitted.
- C. Use of designated areas of new parking facilities by construction personnel is permitted.
- D. Arrange for temporary parking areas to accommodate use of construction personnel.
- E. When site space is not adequate, provide additional off-site parking.

3.04 Permanent pavements and parking facilities

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLARES AND LIGHTS

- A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Drawings indicate haul routes designated by authorities for use of construction traffic.
- C. Confine construction traffic to designated haul routes.
- D. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 TRAFFIC SIGNS AND SIGNALS

- A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- B. Install and operate automatic traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
- C. Relocate as work progresses, to maintain effective traffic control.

3.10 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing and new permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 REMOVAL AND REPAIR

- A. Remove temporary roads when permanent paving is usable.
- B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.
- C. Repair existing and new permanent facilities damaged by use, to original condition.
- D. Remove equipment and devices when no longer required.
- E. Repair damage caused by installation.
- F. Remove post settings to a depth of 2 feet.

3.12 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

TEMPORARY EROSION AND SEDIMENT CONTROL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Revegetation of disturbed areas.
- E. Performance bond.
- F. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2017.
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2009.
- J. Texas Commission on Environmental Quality - Storm Water Pollution Prevention Plan (SWPPP) requirements.
- K. State, local, County and Municipal SWPPP requirements.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements for erosion and sedimentation control, as specified for the Texas Pollutant Discharge Elimination System (TPDES), Phases I and II, under requirements for the Construction General Permit (CGP); current edition.
- B. Comply with all more stringent requirements of the County and municipal.
- C. Comply with all requirements of the SWPPP for erosion and sedimentation control.
- D. Best Management Practices Standard: FHWA FLP-94-005.
- E. Runoff Calculation Standard for Urban Areas: USDA TR-55.

- F. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- G. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Contractor will obtain permits and pay for securities required by authority having jurisdiction.
 - 2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- H. If required by the Owner, provide a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- I. Timing: Put preventive measures in place as soon as possible before disturbance of surface cover and before precipitation occurs.
- J. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 10 years.
- K. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- L. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud and sediment onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- M. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- N. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- O. Open Water: Prevent standing water that could become stagnant.
- P. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch:
 1. Straw or hay.
 2. Wood waste, chips, or bark.
 3. Erosion control matting or netting.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Bales: Bound, rectangular straw bales.
- D. Bale Stakes:
 1. Steel U- or T-section.
 2. Wood.
 3. Minimum Length: 3 feet.
- E. Silt Fence Fabric: Polypropylene, polyethylene, or polyamide woven or nonwoven geotextile fabric resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 1. Minimum Unit Weight: 4.5 oz/yd.
 2. Minimum Width: 36 inches.
 3. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 4. Mullen Burst Strength: 190 lb/sq in.
 5. Permittivity: 0.05 sec⁻¹, minimum, when tested in accordance with ASTM D4491/D4491M.
 6. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 7. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 8. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533.
 9. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 10. Woven Wire Backing: 2"x4" 12 gauge (min.), welded wire, galvanized.
- F. Silt Fence Posts:
 1. Steel Y- or T-section, with minimum mass of 1.25 lb per linear foot.
 2. Minimum Length: 4 feet.
 3. Galvanized or painted surface.
 4. Brindle Hardness: Greater than 140.
- G. Riprap: See Section 31 3700.

- H. Filter Bags: Polypropylene, polyethylene or polyamide woven fabric.
 - 1. Unit Weight: 4 oz/sq yd.
 - 2. Mullen Burst Strength: Greater than 300 psi.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
 - 4. Filter Bag Fill: Washed pea gravel to coarse ground (0.31" to 0.75" diameter).
- I. Rock Berms
 - 1. Rock: Clean, open graded, 3 to 5 inch diameter; high velocity areas should use 5 to 8 inch diameter.
 - 2. Woven wire; 20 gauge, maximum 1" opening, galvanized, secured with shoat rings.
- J. Stabilized Construction Entrance
 - 1. Rock: 4" to 8", washed.
 - 2. Fabric: Geotextile specific for soil filtration; 6 oz/sq yd; Mullen burst rating of 140 lb/sq in, greater than #50 sieve opening size.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: 12 feet, minimum, or full width of driveway, whichever is greater.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences or rock riprap.
 - 1. Provide linear sediment barriers as detailed on drawings with the following parameters:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
 - e. Across the entrances to culverts that receive runoff from disturbed areas.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Bagged gravel inlet protection: As detailed on drawings.
- E. Storm Drain Inlet: As detailed on drawings.

- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 4 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
 - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 3 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
 - 4. Reference details on the drawings.
- B. Silt Fences:
 - 1. Install with top of fabric at nominal height and embedment indicated on drawings.
 - 2. Embed bottom of fabric in a trench on the upslope side of fence, with 6 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
 - 3. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 - 4. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 - 5. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
 - 6. Reference details on the drawings.
- C. Straw Bale Rows:
 - 1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 - 2. Install bales so that bindings are not in contact with the ground.
 - 3. Embed bales at least 4 inches in the ground.
 - 4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 - 5. Fill gaps between ends of bales with loose straw wedged tightly.
 - 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
 - 1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
 - 2. Wood Waste: Apply 6 to 9 tons per acre.
 - 3. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Mulching Over Small and Medium Areas:
 - 1. Dry Straw and Hay: Apply 4 to 6 inches depth.
 - 2. Wood Waste: Apply 2 to 3 inches depth.

3. Pine Needles: Apply 2 to 3 inches depth.
 4. Erosion Control Matting: Comply with manufacturer's instructions.
- F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
 5. Incorporate fertilizer into soil before seeding.
 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 8. Repeat irrigation as required until grass is established.
- G. Rock Berms
1. Layout the woven wire mesh sheathing perpendicular to the direction of runoff.
 2. Rock berm will have a minimum top width of 2 feet with side slopes being 2:1 (h:v) or flatter.
 3. Place rock along the sheathing to a height not less than 18".
 4. Wrap the wire sheathing around the rock and secure with tie wire so that the ends of the sheathing overlap a minimum of 2 inches.
 5. Tie the ends of the berm into the existing upslope grade and bury the berm 3 to 4 inches into existing ground slope.
- H. Stabilized Construction Entrance
1. Remove vegetation and grade for positive drainage.
 2. Construct entrance a minimum 12 feet wide (or full width of road) by 50 feet long.
 3. If slope towards a paved street exceeds 2 percent, construct a ridge 6 to 8 inches high with 3:1 (h:v) side slopes across the foundation 15 feet from the entrance to divert runoff away from street.
 4. Place geotextile woven fabric in graded foundation.
 5. Place stone over geotextile woven fabric per the drawings.
 6. Grade to drain runoff to a sediment trap or basin.
 7. Install drain pipe, as needed, to maintain street drainage in right-of-way.

3.05 MAINTENANCE

- A. Inspect preventive measures daily, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
1. Promptly replace fabric that deteriorates.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

- D. Straw Bale Rows:
 - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 - 2. Remove silt deposits that exceed one-half of the height of the bales.
 - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Filter Bags:
 - 1. Promptly replace bags that have deteriorated or have been damaged.
 - 2. Remove silt deposits that exceed one-third the height of the bag.
 - 3. Repair or replace bags that are undercut by runoff or otherwise are damaged, whether by runoff or other causes.
- F. Stabilized Construction Entrance
 - 1. Promptly replace rock that has deteriorated or been damaged.
 - 2. Remove excess dirt and sediment accumulations as needed.
- G. Rock Berms
 - 1. Promptly repair or replace rock berms that have been undercut by runoff or otherwise damaged.
 - 2. Remove silt deposits that exceed one-third the height of the rock berm.
 - 3. Repair any loose wire sheathing.
- H. Clean out temporary sediment control structures weekly and relocate soil on site.
- I. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SPILL RESPONSE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Guideline for Contractors for handling petroleum hydrocarbon spills and leaks on the project site.

1.02 RELATED SECTIONS -- NOT USED**1.03 REFERENCES**

- A. Texas Commission on Environmental Quality Regulations, TAC Ch. 327.
- B. Edwards Aquifer Authority, Ch. 713, Subchapter E.

1.04 SUBMITTALS

- A. Summary report of procedures and operational sequence for review and approval by Pape-Dawson Engineers (Engineer) as Owner's Representative.
- B. Manifest and disposal records.
- C. Testing and laboratory sampling results.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Contractor to pay for any and all testing, excavation, disposal, and consultants/contractors required for the execution of the work.

PART 3 EXECUTION**3.01 CONDITIONS**

- A. Texas Commission on Environmental Quality (TCEQ) and Edwards Aquifer Authority (EAA) regulations require reporting of fuel spills or leaks of 25 gallons or more to the land surface, or any quantity sufficient to create a sheen on surface water. For oils, the reporting requirements are a spill of 210-gallons to the land surface or a quantity sufficient to create a sheen on surface water.
- B. Spills of quantities to the land in excess of 1-gallon, or spills that affect more than 10-square feet of ground surface, although not large enough to require reporting to TCEQ, must be reported by the Contractor to the Engineer and appropriate emergency response actions should be implemented.
- C. Cleanup of any spills related to the project shall be completed to non-detect conditions, unless the constituent is naturally occurring in which case TCEQ State specific background concentrations may be used as cleanup goals, as determined by the Engineer.

3.02 SPILL RESPONSE ACTIONS

- A. Appropriate response actions may vary, depending on the volume spilled or leaked and the location of the spill.
 - 1. In all cases, attempts to minimize the volume lost and the size of the area affected should be made.
 - 2. Spills/leaks on asphalt, concrete or other impervious surface, may be cleaned using absorbent materials, i.e., oil absorbent pads or socks, or granular material.
 - 3. Spills/leaks to soil or bedrock will likely require excavation.

- B. Contractor to take immediate action to contain the spill. Implement emergency response measures to stop and contain leak/spill. Appropriate emergency response measures include, but are not limited to, placement of absorbent materials on top of and downstream of leak/spill or construction of berm downstream of leak/spill to prevent further spread of material.
- C. Contact Fire Department or other appropriate Emergency Management Agency as necessary to minimize loss of property or life.
- D. Notify Engineer within 24 hours of the leak/spill.
- E. Notify TCEQ and EAA if the project is within the Edwards Aquifer Recharge Zone or 5 miles upgrade within 24 hours if quantity of material leaked/spilled meets Section 3.01, A. above.
- F. Follow protocol as shown on attached flow chart that describes some possible scenarios.

3.03 CLEANUP

- A. Impacted material should be segregated from material not impacted by the leak/spill. Impacted materials may include loose material, absorbent material, or excavated material.
- B. Excavated and segregated materials should be stored on plastic and covered with plastic, or stored within a drum, roll-off box, or other covered container, pending characterization and disposal at an approved disposal facility.
- C. The volume of material segregated and disposed should be recorded, and copies of disposal manifests should be provided to the Engineer.
- D. After excavation of impacted soil, the Engineer will evaluate the area excavated and determine if sampling of remaining subgrade will be necessary.
- E. The determination will be made on a site-specific basis and will be a function of volume spilled/leaked, size of area affected, soil type, type of product spilled/leaked, location of spill/leak, etc.
- F. If sampling and analysis indicate constituents of concern are detected in the soil or rock subgrade, then additional excavation will be necessary. The Contractor shall continue to excavate at the direction of the Engineer until further sample and analysis results indicate that constituents of concern are no longer detected.
- G. After Engineers approval, the excavated area may be backfilled.
- H. The Contractor may hire their own environmental consultant/contractor to perform sampling, analysis, and cleanup oversight. In this case the Contractor's consultant must coordinate all their activities with the Engineer prior to each step, phase, or course of action.
- I. The Engineer may collect additional confirmation samples if warranted, and will provide approval that corrective actions are complete before the excavation is backfilled.
- J. Contractor must notify Engineer 48-hours in advance of sample collection and disposal. Contractor must provide Engineer or designated construction observer with opportunity to observe Contractor's implementation of approved cleanup method and to collect and split samples, if so desired by Engineer.

END OF SECTION

TEMPORARY PROJECT SIGNAGE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Project identification sign.
- B. Project informational signs.

1.02 RELATED REQUIREMENTS -- NOT USED**1.03 REFERENCE STANDARDS -- NOT USED****1.04 QUALITY ASSURANCE**

- A. Design sign and structure to withstand 30 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

- A. Shop Drawing: Show content, layout, lettering, and color to the Owner for approval prior to installation .

PART 2 PRODUCTS**2.01 SIGN MATERIALS**

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized, aluminum, or brass.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, colors as selected.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign of construction, design, and content indicated on drawings, location designated.
- B. Content:
 - 1. Project title and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of authorities.
 - 3. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Owner.

2.03 PROJECT INFORMATIONAL SIGNS

- A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
- B. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install project identification sign within 20 days after date fixed by Notice to Proceed.

- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.
- F. No other signs or advertising will be permitted on the site without specific authorization.
- G. Maintain sign in good condition for the duration of the job.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

EXECUTION AND CLOSEOUT REQUIREMENTS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 - Temporary Facilities and Controls.
- B. Section 01 5100 - Temporary Utilities.
- C. Section 01 5713 - Temporary Erosion and Sedimentation Control.
- D. Section 01 7800 - Closeout Submittals.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

- A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.
6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to the Owner. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 1. Minimize amount of bare soil exposed at one time.
 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
 2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
- H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 1. Pest Control Service: Weekly treatments.
- I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- 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 any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer and Owner four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- H. Utilize recognized engineering survey practices.
- I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- K. Periodically verify layouts by same means.
- L. Maintain a complete and accurate log of control and survey work as it progresses.
- M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Engineer before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction in locations indicated on drawings.
 - 2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.

2. Remove items indicated on drawings.
 3. Relocate items indicated on drawings.
 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services: Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Coordinate with Owner for limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- I. Do not begin new construction in alterations areas before demolition is complete.
- J. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.

- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Prohibit traffic from landscaped areas.
- E. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.

- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean debris from drainage systems.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Engineer and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer when work is considered ready for Engineer's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer.
- F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements.
- G. Accompany Project Coordinator on Contractor's preliminary final inspection.
- H. Notify Engineer when work is considered finally complete and ready for Engineer's Substantial Completion final inspection.
- I. Complete items of work determined by Engineer listed in executed Certificate of Substantial Completion.

END OF SECTION

FIELD ENGINEERING**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall, at his expense, perform the following:
 - 1. Engage a licensed Surveyor, approved by the Owner, and acceptable to the Engineer, to locate all surveyor marks, including bench marks in order that the exact lines of the property, building and grades may be determined.
 - 2. Lay out entire Project prior to start of construction.
 - 3. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction. Replace project control points which may be lost or destroyed.
 - 4. Establish a minimum of two permanent bench marks on the site, referenced to data established by survey control points. Record locations, with horizontal and vertical data, on Project Record Documents.
 - 5. Establish all construction lines and levels by instrumentation and similar appropriate means.
- B. Any discrepancies arising in locating the work in respect to property and building line shall be reported immediately to the Owner and the Engineer.

END OF SECTION

CLOSEOUT SUBMITTALS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Individual Product Sections: Specific requirements for operation and maintenance data.
- B. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. 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.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 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.
- 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 utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.

- E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Engineer, Consultants, Contractor and subcontractors, with names of responsible parties.
- H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- L. Arrange content by systems or process flow under section numbers and sequence of Table of Contents of this Project Manual.
- M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, 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 or process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify 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 special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 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. Photocopies of warranties and bonds.
- N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Engineer, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include photocopies of each in operation and maintenance manuals, indexed separately on Table of Contents.
- F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

WARRANTIES AND BONDS**PART 1 - GENERAL****1.01 SUBMITTAL REQUIREMENTS**

- A. Assemble warranties, bonds and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Review submittals to verify compliance with Contract Documents. Submit to Engineer for review and transmittal to Owner.

1.02 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during progress of construction submit within 10 days after acceptance.
- B. Otherwise make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

END OF SECTION

Bond No. _____

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we _____ hereinafter referred to as PRINCIPAL, and _____, a corporation organized under the laws of the State of Texas, and duly authorized to do business in the State of Texas, hereinafter referred to as SURETY, are held and firmly bound unto City of New Braunfels, Texas as OBLIGEE, in the sum of \$_____, for the payment of which we bind ourselves, heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, PRINCIPAL has constructed certain improvements described as

_____ ; and

WHEREAS, PRINCIPAL is obligated to protect the CITY against any defects resulting from faulty materials or workmanship of said improvements and to maintain said improvements and keep in good repair for a period of two (2) years from the date accepted in writing by the City Engineer.

NOW, THEREFORE, the condition of this obligation is such that if PRINCIPAL shall promptly and faithfully protect the CITY against any defects and correct any defects resulting from faulty materials or workmanship of the aforesaid improvements and maintain said improvements for a period of two (2) years from the date the City Engineer accepts the final improvements, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

If in the sole opinion of the City Engineer, a defect results from faulty materials or workmanship; or if in the sole opinion of the City Engineer there is a any item that is not properly maintained that the City Engineer finds is the responsibility of the PRINCIPAL, then the CITY Engineer shall notify the PRINCIPAL in writing of (1) any defect for which the PRINCIPAL is responsible and (2) any item that is not properly maintained and shall specify in said notice a reasonable period of time within which PRINCIPAL shall have to correct said defect or properly maintain said item.

The SURETY unconditionally covenants and agrees that if the PRINCIPAL fails to perform within the time specified, the SURETY, upon forty-five (45) days written notice from the CITY, or its authorized agent or officer, of the default will forthwith correct such defect or defects, perform the required maintenance and pay all CITY costs related hereto, including, but not limited to, construction costs, engineering costs, legal fees (including attorney fees on appeal) and contingent costs, together with any damages either direct or consequential, which may be sustained on account of the failure of the PRINCIPAL to correct said defects. Should the SURETY fail or refuse to correct said defects and perform the required maintenance, the CITY, in view of the public interest, health, safety and welfare factors involved, and the consideration in approving and filing the said development, shall have the right to resort to any and all legal remedies against the PRINCIPAL and SURETY, both at law and in equity, including specific performance, to which term the PRINCIPAL and SURETY unconditionally agree.

The PRINCIPAL and SURETY further jointly and severally agree that the CITY, at its option, shall have the right (1) to correct said defects and (2) to perform the required maintenance in case the PRINCIPAL shall fail or refuse to do so, and in the event the CITY should exercise and give effect to such right, the PRINCIPAL and the SURETY shall be jointly and severally obligated hereunder to reimburse the

CITY the total cost thereof, including, but not limited to, construction costs, engineering costs, legal fees (including attorney fees on appeal) and contingent costs, together with any damages either direct or consequential, which may be sustained on account of the failure of the PRINCIPAL to correct said defects.

Whenever a defect or failure of any required improvement occurs within the period of coverage, the city shall require that a new maintenance bond or surety instrument be posted for a period of one full calendar year sufficient to cover the corrected defect or failure.

IN WITNESS WHEREOF, the PRINCIPAL and the SURETY have executed these presents this _____ day of _____, 20____.

Principal
(Corporate Seal)

By: _____
Its: _____

ATTEST:

By: _____
(If a Corporation)
Its: _____

Surety
(Corporate Seal)

By: _____
Attorney-in-Fact

WITNESSES:

Note: Attach Power of Attorney to this Bond

SUBSURFACE INVESTIGATION**PART 1 - GENERAL****1.01 SUMMARY**

- A. A Geotechnical Report (available for review in the office of the Engineer) was obtained for use in preparing the design.
- B. The Geotechnical Report is not a conclusive indication of the soil conditions other than where the borings were taken.
- C. The accuracy of the Geotechnical Report is not guaranteed in any respect by the Owner, and the Owner accepts no responsibility for interpretation of conclusions drawn therefrom.
- D. The information contained in the Geotechnical Report is made available in order that the Contractor may have ready access to the same information available to the Owner as of this date.
- E. Contractor is invited and encouraged to make his own interpretation and evaluation of the information and by starting work shall be assumed to have fully accepted responsibility for the subsurface conditions that may hereafter be encountered in performing the excavation work.
- F. Contractor is to examine the project site and the record of investigation and make, to whatever extent they deem appropriate, his own investigation of existing subsurface conditions to determine the nature, kind and character of materials to be encountered.
- G. Extra payment will not be authorized for work which should have been anticipated or could have been anticipated upon careful examination of the site, or upon soil investigation, or upon consideration of factors generally recognized as being inherent in excavation work of the nature indicated by the Contract Documents.
- H. The Contractor shall advise Engineer of discovery of any unknown or undetermined items.
- I. The Contractor shall make their own investigation into the location and size of existing site utilities whether represented on the drawings or not.

END OF SECTION

SITE DEMOLITION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Selective demolition of existing site elements.
- B. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

- A. Section 01 5713 - Temporary Erosion and Sediment Control.
- B. Section 01 7419 - Construction Waste Management and Disposal.
- C. Section 02 6500 - Underground Storage Tank Removal.
- D. Section 31 1000 - Site Clearing.
- E. Section 31 1000.10 - Tree Protection.
- F. Section 31 2200 - Grading.
- G. Section 31 2316 - Excavation.
- H. Section 31 2323 - Fill.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS -- NOT USED**PART 3 EXECUTION****3.01 SCOPE**

- A. Install temporary erosion and sedimentation control measures.
- B. Remove paving, curbs, and sidewalks as required to accomplish new work.
- C. Break up paving as indicated on drawings to permit positive drainage. Remove all broken pavement and dispose of properly.
- D. Within area of new construction, completely remove foundation walls and footings to a minimum of 4 feet below finished grade.
- E. Remove concrete slabs on grade as indicated on drawings.
- F. Remove underground tanks as indicated on drawings.
- G. Remove manholes and manhole covers, curb inlets and catch basins as indicated on drawings.
- H. Remove fences, gates, signs, poles, lighting and irrigation as indicated on drawings.

- I. Coordinate with the Landscape Architect and Owner prior to removing landscaping and trees. Landscaping and trees that remain should be fenced and protected from removal. Trees to remain will be protected in accordance with local standards for tree protection.
- J. All obstructions which may not be indicated in the Contract Documents to be removed, but that do interfere with the completion of the work as indicated by this Contract, are also made a part of this Section and their removal shall be included in this Contract.
- K. Any item not specifically designated for removal shall not be removed without Engineer's direction.
- L. When excavations, open pits, and holes are created as a result of site work activities, compacted specified fill is required to backfill to rough grade elevations.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain and pay for required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until existing elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- E. Do not begin removal until all site utility services have been terminated, disconnected and capped.
- F. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

- I. If hazardous materials or narcotics are discovered during removal operations, stop work and notify Engineer and Owner; hazardous materials include regulated asbestos containing materials, lead, lead-based paint, PCB's, and mercury.
- J. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 7419 - Waste Management.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- K. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
- L. Underground Storage Tanks and Associated Piping and Dispensers: Remove and dispose of as specified in Section 02 6500.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits prior to terminating service.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without prior written approval from Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without prior approval from Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Unless otherwise indicated on the drawings remove unused underground piping within project limits.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
- I. Pipes, culverts, utilities, or conduits shown on the plans to be abandoned in place shall be backfilled with inert fill material and capped.

3.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

GEOLOGIC FEATURE REMEDIATION**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Work required to clean-out, fill, and seal geologic features (solution features) discovered during construction of utilities, drainage improvements, streets, parking, building foundations, other site work activities, and water pollution abatement basins.
- B. Furnish all supplementary items necessary for their remediation in accordance with approved Texas Commission on Environmental Quality (TCEQ) requirements.
- C. This specification shall apply to feature remediation not requiring use of reinforcing steel.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000.10 - Controlled Low Strength Backfill.
- B. Section 31 2316 – Excavation.
- C. Section 31 2316.13 - Trenching.
- D. Section 31 2316.14 - Trench Excavation Protection.
- E. Section 33 1116 - Site Water Utility Distribution Piping.
- F. Section 33 3111 - Site Sanitary Sewer Utility Piping.
- G. Section 33 4111 - Site Storm Utility Drainage Piping.

1.03 REFERENCES

- A. Texas Commission on Environmental Quality (TCEQ) Water Pollution Abatement Plan (WPAP) and/or Sewage Collection System (SCS) regulations.
- B. Requirements of TCEQ WPAP and SCS project permits.

1.04 CONDITIONS

- A. If any caverns or sensitive features are discovered during utility or storm drain trenching activities, street or site grading, foundation and/or pier construction, or other site work activities, all regulated activities near the sensitive feature must be suspended immediately.
 - 1. The Contractor must notify the Owner and Engineer immediately of the discovery.
 - 2. The Engineer will notify the appropriate regional office of the Texas Commission on Environmental Quality in writing within two working days of the feature discovery.
 - 3. The regulated activities near the feature may not proceed until the TCEQ Executive Director has reviewed and approved the methods proposed for disposition of the feature and protection of the Edwards Aquifer from any potentially adverse impacts to water quality while maintaining the structural integrity of the line where a utility or storm drain line is involved.
- B. All contractors conducting regulated activities, including site work and utilities, must keep copies of the submittal and approval letter of the Sewage Collection System and Water Pollution Abatement Plan onsite.

1.05 NOTIFICATION

- A. Contractor must notify Engineer 48-hours in advance of beginning of sealing any geologic feature.
- B. Contractor must provide Engineer or designated construction observer with opportunity to observe Contractor's implementation of approved treatment method.

- C. Geologic features which are found during construction and approved for sealing by TCEQ must be shown and recorded on as-built drawings.

1.06 ACCESS

- A. Contractor must maintain access to the feature until such time as Engineer, Geologist, and TCEQ Representative have had an opportunity to observe the feature(s).
- B. Contractor will be notified by Engineer and/or Geologist when they will observe the feature.
- C. Contractor must provide safe access to Engineer, Geologist and/or TCEQ personnel to the feature.
- D. Trench excavation protection must be provided at all times in accordance with Section 31 2316.14 Trench Excavation Protection.
- E. Upon discovery of a feature, Contractor shall immediately take measures to limit access to the feature to essential Contractor Personnel, Owner, Engineer, Geologist, TCEQ and SAWS Personnel.
- F. Contractor will not allow any other access to the feature without the authorization of the Owner or Engineer.
- G. The construction time period allowed for this project includes 10 days for delays associated with features remediated under this specification. Where no features requiring remediation under this specification are discovered, the time allowance for feature remediation will be deducted from the construction time period.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete shall conform to Class B and shall be mixed and placed in accordance with Item 420, "Concrete for Structures", TxDOT Standard Specifications.
- B. Flowable fill shall conform to Section 03 3000.10 - Controlled Low Strength Backfill (CLSB).

2.02 MEASUREMENT

- A. Concrete by the cubic yard.
 - 1. Contractor shall provide copies of concrete truck trip tickets to substantiate quantities of concrete used for feature remediation.
 - 2. Contractor shall clearly note on trip tickets the specific features remediated with a specific load.
 - 3. This item will be used only for payment of features where TCEQ approved remediation specifies concrete.
- B. Controlled Low Strength Backfill (CLSB) by the cubic yard.
 - 1. Contractor shall provide copies of delivery truck trip tickets to substantiate quantities of flowable fill used for feature remediation.
 - 2. Contractor shall clearly note on trip tickets the specific features remediated with a specific load.
 - 3. This item will be used only for payment of features where TCEQ approved remediation specifies concrete.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor shall construct feature remediation in accordance with plan approved by TCEQ.

- B. Each feature remediation plan will apply to a specific feature or group of features and will be prepared by the Engineer.
- C. In all cases construction shall be conducted in such a manner as to provide the best protection of the Edwards Aquifer.
- D. Contractor shall not make changes to remediation measures without first getting Engineer's approval.

3.02 CLEANING

- A. Upon the completion of the work of this Section, Contractor shall dispose of, away from the site, all debris, trash containers, residue, remnants and scraps which result from the work of this Section.

END OF SECTION

MAINTENANCE OF CONCRETE**PART 1 GENERAL****1.01 Section Includes**

- A. Cleaning of existing concrete surfaces.
- B. Repair of exposed structural, shrinkage, and settlement cracks.
- C. Resurfacing of concrete surfaces having spalled areas and other damage.
- D. Repair of deteriorated concrete.
- E. Repair of internal concrete reinforcement.
- F. Restoration and patching of concrete surfaces.

1.02 Related Requirements

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 03 3000 - Cast-in-Place Concrete.

1.03 Price and Payment Procedures

- A. Repair Surface: By the square foot. Includes surface preparation, repair, finishing.
- B. Preparation for Resurfacing: By the square foot. Includes surface preparation, cleaning.

1.04 Reference Standards

- A. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- D. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2007b (Reapproved 2014).
- E. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2014.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- I. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2014.
- J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- K. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear; 2012.
- L. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Material for Concrete Repairs; 2013.
- M. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.

- N. ASTM D3039/D3039M - Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials; 2017.
- O. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2010.
- P. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2010.
- Q. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- R. ICC-ES AC178 - Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) or Steel-Reinforced Polymer (SRP) Composite Systems; 2017, with Editorial Revision 2020.

1.05 Administrative Requirements

- A. Scheduling: Perform work during a time period allowed by authority having jurisdiction of road right-of-way.

1.06 Submittals

- A. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- B. Field quality control submittals.
- C. Field quality control submittals for CFRP.
- D. Manufacturer's Certificate: Certify that specified products meet or exceed specified requirements.
- E. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

1.07 Quality Assurance

- A. Designer Qualifications: Design reinforcement splices under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
- C. Cleaner Qualifications: Company specializing in performing work of the type specified.
- D. Installer Qualifications: Company specializing in performing work of the type specified.
- E. Perform welding work in accordance with AWS D1.4.

1.08 Delivery, Storage, and Handling

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.01 Cleaning Materials

- A. Detergent: Non-ionic detergent.
- B. Blasting Medium: Sand.

2.02 Cementitious Patching and Repair Materials

- A. Cementitious Resurfacing Mortar: One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.

1. In-place material resistant to freezing conditions.
 2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
 3. Integral corrosion inhibitor.
 4. Recommended Thickness: Feather edge to 1/8 inch.
 5. Color: Gray.
- B. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
1. In-place material resistant to freezing conditions.
 2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
 3. Dry Material: Complies with ASTM C928/C928M.
 4. Integral corrosion inhibitor.
- C. Cementitious Repair Mortar, Form and Pour/Pump Grade: Flowable, one- or two-component, factory-mixed, polymer-modified cementitious mortar; in-place material resistant to freezing conditions.
1. Mixed with water in proportions as recommended by manufacturer.
- D. Cementitious Pavement Repair Mortar: Fast hardening, flowable; composed of cement, sand, and additives; capable of setting in cold weather conditions without the aid of chloride- or gypsum-based accelerators; in-place material resistant to freezing conditions.
1. Dry Material: Complies with ASTM C928/C928M.
 2. Integral corrosion inhibitor.
 3. Time To Open To Traffic: 1 hour, maximum.
 4. Time to Top-Coating: 4 hours, maximum.
- E. Cementitious Hydraulic Waterstop: Very fast setting, low slump, hand formable, and capable of stopping active water leaks; in-place material resistant to freezing conditions.
- F. Mix cementitious mortar and grout in accordance with manufacturer's instructions for purpose intended.
- G. Include bonding agent as additive to mix.

2.03 Epoxy Patching and Repair Materials

- A. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.
- B. Mix epoxy mortars in accordance with manufacturer's instructions for purpose intended.
- C. Mix components in clean equipment or containers. Conform to pot life and workability limits.
- D. Epoxy Bonding Adhesive: Non-sag, two-component, 100 percent solids; recommended by manufacturer for purpose and conditions under which used.
1. Bond Strength (ASTM C882): 1,500 psi, minimum.
 2. Tensile Strength (ASTM D638): 6,600 psi, minimum.
 3. Percent Elongation (ASTM D638): 3.3 percent at 7 days at 70 degrees F, maximum.
 4. Compressive Strength (ASTM D695): 10,000 psi, minimum.

2.04 Accessories

- A. Anchoring Adhesive: Self-leveling or non-sag as applicable.

- B. Portland Cement: ASTM C 150, Type I, II, or III; gray or white.
- C. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.
- D. Water: Clean and potable.
- E. Reinforcing Steel: ASTM A615/A615M Grade 40 (40,000 psi) billet-steel deformed bars, unfinished.
- F. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
 - 1. Galvanized in accordance with ASTM A 767/A 767M, Class I or II.
- G. Stirrup Steel: ASTM A1064/A1064M.
- H. Splicing Sleeves: Per shop drawings.

PART 3 EXECUTION

3.01 Examination

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.02 Cleaning Existing Concrete

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
 - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
 - 2. Clean out cracks and voids using same methods.
- C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
 - 1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
 - 2. Increasing the water washing pressure to maximum of 400 psi.
 - 3. Adding detergent to washing water; with final water rinse to remove residual detergent.
 - 4. Steam-generated low-pressure hot-water washing.
 - 5. Abrasive blasting: Use sand.

3.03 Concrete Structural Member Repair

- A. See drawings for specific areas to be repaired.
- B. Remove broken and soft concrete at least 1/4 inch deep.
- C. Mechanically cut away damaged portions of reinforcement.
- D. Remove corrosion from steel and clean mechanically.
- E. Blast clean remaining exposed reinforcement surfaces.
- F. Repair by welding new bar reinforcement to existing reinforcement using sleeve splices.
 - 1. Perform welding work in accordance with AWS D1.4/D1.4M.
 - 2. Make welded sleeve splices to achieve strength to exceed strength of new reinforcement.
- G. Cover exposed steel reinforcement with epoxy mortar.
- H. Work epoxy mortar into broken surface and build up patch to match original.

- I. Feather edges of repairs flush to sound surface and trowel surface to match surrounding area.

3.04 Crack Repair Using Epoxy Adhesive Injection

- A. Repair exposed cracks.
- B. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.
- C. Inject adhesive into ports under pressure using equipment appropriate for particular application.
- D. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.
- E. Remove temporary seal and excess adhesive.
- F. Clean surfaces adjacent to repair and blend finish.

3.05 Concrete Surface Repair Using Cementitious Materials

- A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.
- B. Apply coating of bonding agent to entire concrete surface to be repaired.
- C. Fill voids with cementitious mortar flush with surface.
- D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface, terminating at a vertical change in plane on all sides.
- E. Trowel finish to match adjacent concrete surfaces.
- F. Damp cure for four days.

3.06 Field Quality Control

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. An independent testing agency will perform field inspection and testing.
 - 1. Test concrete for calcium chloride content during the execution of the Work.
 - 2. Field Quality Control for CFRP:
 - a. Inspect installation and test for compliance with ICC-ES AC178.
 - b. Inspect for voids, bubbles, and delaminations by performing a visual and acoustic tap test of layered surface after 24 hours of initial resin saturant cure.
 - c. Test for material properties of CFRP in accordance with ASTM D3039/D3039M.
 - d. Nonconforming Work: Repair defective work after minimum cure time for CFRP laminates.

END OF SECTION

CONCRETE FORMING AND ACCESSORIES**PART 1 GENERAL****1.01 Section Includes**

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 Related Requirements

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 Price and Payment Procedures

- A. See Section 01 2200 - Unit Prices, for additional unit price requirements.
- B. Measurement and payment of forming work will be by the unit price method.
- C. Formwork (Vertical Structures): Measure by the square foot. Includes form materials, placement, placing accessories, stripping.
- D. Formwork (Horizontal Structures): Measure by the square foot. Includes form materials, placement, placing accessories, stripping.

1.04 Reference Standards

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- C. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- D. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- E. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- F. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- H. ACI 347R - Guide to Formwork for Concrete; 2014.
- I. ASME A17.1 - Safety Code for Elevators and Escalators; 2013.
- J. PS 1 - Structural Plywood; 2009.

1.05 Submittals

- A. Product Data: Provide data on void form materials and installation requirements.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
- C. Permanent Insulated Foam Panel Formwork Shop Drawings: Include calculations or selections from manufacturer's prescriptive design tables that indicate compliance with applicable building code and manufacturer's requirements.
 - 1. Include test reports for performance criteria specified.

- 2. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Design Data: As required by authorities having jurisdiction.
- E. Construction Joints: Submit diagram of proposed construction joints not shown on the Drawings prior to or concurrent with reinforcing bar shop drawings.

1.06 Quality Assurance

- A. Perform work of this section in accordance with Texas Department of Transportation standards.
- B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

1.07 Delivery, Storage, and Handling

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 Formwork - General

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Chamfer outside corners of beams, joists, columns, and walls.
- D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- E. Comply with relevant portions of ACI CODE-318, ACI PRC-347, and ACI SPEC-301.
- F. Comply with Texas Department of Transportation standards.
- G. Use the following form types:
 - 1. Walls Not Exposed To View: Site fabricated plywood of sufficient thickness capable of sustaining the loads.
 - 2. Walls Exposed To View: Commercial grade, moisture resistant, smooth-faced plywood of sufficient thickness capable of sustaining the loads.
 - 3. Elevated Floor/Roof Slabs: Permanent prefabricated foam panel formwork; formwork to remain.
- H. Form Ties:
 - 1. Form ties for exposed concrete surfaces shall be manufactured to allow a positive break back of no less than one inch (1") inside the concrete surface.
 - 2. Ties shall be equipped with a plastic cone of not less than five-eighths inch (5/8") diameter and one inch (1") long which will completely cover the hole and prevent the leakage of any mortar.
 - 3. Form ties for unexposed surfaces shall be bolt rods or patented devices having a minimum tensile strength of three thousand (3,000) pounds when fully assembled.

4. Ties shall be adjustable in length and free of lugs, cones, washers or other features which would leave a hole larger than seven-eighths inch (7/8") in diameter, or depressions back of the exposed surface of the concrete.
5. Ties shall be of such construction that, when the forms are removed, there will be no metal remaining within one inch (1") of the finished surface of the concrete.

2.02 Wood Form Materials

- A. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.
- B. Plywood: Douglas Fir, Spruce, or Yellow Pine species; solid one side grade; sound undamaged sheets with clean, true edges.
- C. Lumber: Yellow Pine species; #2 grade; with grade stamp clearly visible.

2.03 Removable Prefabricated Forms

- A. Preformed Steel Forms: Minimum 16 gauge, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Preformed Plastic Forms: Thermoplastic polystyrene, thermoplastic, thermosetting, filled polyurethane elastomer; or polyurethane elastomer form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- D. Pan Type: Steel or glass fiber, of size and profile indicated.
- E. Tubular Column Type: Round, Spirally wound laminated fiber, wood, or glass fiber material, surface treated with release agent, non-reusable, of sizes indicated.
- F. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set.

2.04 Permanent Prefabricated Foam Panel Formwork

- A. Floor/Roof Deck Forms: Pre-engineered expanded polystyrene foam plastic deck and beam/joist forms with factory installed metal channel furring strips flush with face of panel and field installed form stiffener slots.
 1. Structural Performance: In accordance with applicable code.
 2. Form Cross Section: As indicated on drawings; flat-bottomed solid foam blocks with voids only for stiffeners and beam/joist cross-section; interlocking long edges.

2.05 Formwork Accessories

- A. Form Ties: Removable or snap-off type, galvanized metal or plastic, fixed length, cone type, 1 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.
- C. Filler Strips for Chamfered Corners: Rigid plastic or wood strip type.

- D. Dovetail Anchor Slot: Galvanized steel, at least 22 gauge, 0.0299 inch thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork. Provide _____ manufactured by _____.
- E. Flashing Reglets: Galvanized steel, at least 22 gauge, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork. Provide _____ manufactured by _____.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- G. Waterstops: Rubber or polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range.

PART 3 EXECUTION

3.01 Examination

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 Earth Forms

- A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 Erection - Formwork

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Install permanent insulated foam panel formwork per manufacturer's recommendations.
- D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- E. Align joints and make watertight. Keep form joints to a minimum.
- F. Obtain approval before framing openings in structural members that are not indicated on drawings.
- G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.
- H. Coordinate this section with other sections of work that require attachment of components to formwork.
- I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

3.04 Application - Form Release Agent

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 Inserts, Embedded Parts, and Openings

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 Form Cleaning

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 Formwork Tolerances

- A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.
- B. Construct permanent insulated foam panel formwork to maintain tolerances required by ACI SPEC-301.
- C. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.
- D. Camber slabs and beams in accordance with ACI SPEC-301.

3.08 Field Quality Control

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 Form Removal

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

CONCRETE REINFORCING**PART 1 GENERAL****1.01 Section Includes**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 Related Requirements

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 Price and Payment Procedures

- A. Bar Reinforcement: By the ton. Includes reinforcement, placement, and accessories.
- B. Welded Wire Reinforcement: By the square foot. Includes welded wire reinforcement, placement, and accessories.

1.04 Reference Standards

- A. ACI MNL-66 - ACI Detailing Manual; 2020.
- B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- D. ACI SP-66 - ACI Detailing Manual; 2004.
- E. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- F. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- G. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2006 (Reapproved 2011).
- H. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- I. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
- J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- K. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- L. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2006 (Reapproved 2011).
- M. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2014.
- N. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- O. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2007b (Reapproved 2014).
- P. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

- Q. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2014.
- R. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- S. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars; 2001 (Reapproved 2007).
- T. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- U. CRSI (DA4) - Manual of Standard Practice; 2009.
- V. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.05 Submittals

- A. Shop Drawings: Comply with requirements of ACI MNL-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- B. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- C. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.06 Quality Assurance

- A. Perform work of this section in accordance with ACI SPEC-301.
 - 1. Maintain one copy of each document on project site.
- B. Provide Engineer with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

PART 2 PRODUCTS

2.01 Reinforcement

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280), Unfinished.
- B. Reinforcing Steel: ASTM A 706/A 706M, deformed low-alloy steel bars, Unfinished.
- C. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
 - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- D. Reinforcing Steel Mat: ASTM A704/A704M, using ASTM A615/A615M, Grade 40 (40,000 psi) steel bars or rods, unfinished.
- E. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- F. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: 4 x 8-W6 x W10.
 - 3. Wire Gage: W4xW4 unless otherwise indicated on drawings.
- G. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 Fabrication

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Engineer. Perform welding in accordance with AWS D1.4/D1.4M.
 1. Galvanized and Epoxy Coated Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI (DA4).
- C. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
- D. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 1. Review locations of splices with Engineer.

PART 3 EXECUTION

3.01 Placement

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as follows:
 1. Beams: 2 inch or per Engineer's drawings.
 2. Supported Slabs and Joists: 2 inch or per Engineer's drawings.
 3. Column Ties: 2 inch or per Engineer's drawings.
 4. Walls (exposed to weather or backfill): 2 inch or per Engineer's drawings.
 5. Footings and Concrete Formed Against Earth: 2 inch or per Engineer's drawings.
 6. Slabs on Fill: 2 inch or per Engineer's drawings.
- E. Reinforcement shall be accurately placed and securely saddle tied at every other intersection with No. 18 gauge black annealed wire, and shall be rigidly held in place during the placing of the concrete by means of metal chairs or spacers.
- F. Bars in concrete walls shall be held in position, and to proper clearance, by means of concrete or metal spacer made especially for the locations where spacers are required.
- G. Bars in beams and slabs shall be held to exact location during placing of concrete by spacers, chairs, or other necessary supports.
- H. Comply with applicable code for concrete cover over reinforcement.
- I. Bond and ground all reinforcement.

3.02 Field Quality Control

- A. An independent testing agency will inspect installed reinforcement for conformance to contract documents before concrete placement.

3.03 Schedules

- A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.
- B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement, galvanized finish.

- C. Reinforcement For Parking Structure Framing Members: Deformed bars, epoxy coated finish.

END OF SECTION

CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.01 Section Includes**

- A. Concrete formwork.
- B. Concrete shear walls, elevator shaft walls, and foundation walls.
- C. Joint devices associated with concrete work.
- D. Miscellaneous concrete elements.
- E. Concrete curing.

1.02 Related Requirements

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- D. Section 32 1250 - Site Pavement.

1.03 Price and Payment Procedures

- A. Cement: By the cubic yard.

1.04 Reference Standards

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; 1998 (Reapproved 2004).
- D. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- E. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- F. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- G. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- H. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- I. ACI 305R - Hot Weather Concreting; 2010.
- J. ACI 306R - Cold Weather Concreting; 2010.
- K. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
- L. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- M. ACI 347R - Guide to Formwork for Concrete; 2014.
- N. ACI PRC-304 - Heavyweight Concrete: Measuring, Mixing, Transporting and Placing; 2020.
- O. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- P. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

- Q. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- R. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- S. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- T. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
- U. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- V. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- W. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2007b (Reapproved 2014).
- X. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- Y. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.
- Z. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- AA. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- AB. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- AC. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- AD. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- AE. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- AF. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- AG. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- AH. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- AI. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2014.
- AJ. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- AK. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- AL. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- AM. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.
- AN. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

- AO. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- AP. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- AQ. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.
- AR. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- AS. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011.
- AT. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- AU. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- AV. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars; 2001 (Reapproved 2007).
- AW. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).
- AX. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).
- AY. 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; 2011.
- AZ. ASTM E 1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers [Metric]; 1996 (Reapproved 2008).
- BA. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.
- BB. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 1998 (Reapproved 2013).
- BC. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.
- BD. COE CRD-C 513 - COE Specifications for Rubber Waterstops; 1974.
- BE. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.
- BF. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

1.05 Submittals

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- B. Construction Joints: Submit drawing of proposed construction joints for slab on grade, etc. where they are not indicated on the drawings.
- C. Laboratory Test Reports and Mix Design: Submit laboratory test reports for concrete materials and mix designs as specified in the Testing Laboratory section of the Specifications.
- D. Test Reports: Submit report for each test or series of tests specified.

- E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- F. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

1.06 Quality Assurance

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 Formwork

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 Reinforcement Materials

- A. Comply with requirements of Section 03 2000.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- C. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
 - 1. Form: Flat sheets or coiled rolls.
 - 2. Mesh Size: 6"x6", unless otherwise noted on drawings.
 - 3. Wire Gage: W 4 x W 4, unless otherwise noted on drawings.
- D. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 Concrete Materials

- A. Cement: ASTM C 150, Type I - Normal portland type. Use one brand of cement throughout project.

1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire all aggregates for entire project from same source for exposed concrete only.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Calcined Pozzolan: ASTM C618, Class N.
- F. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.
- G. Waterproofing Additive: Crystalline waterproofing intended for mixing into concrete to close concrete pores by growth of crystals, with no decrease in concrete strength or chemical resistance.
 1. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 350 feet of head; provide test reports.
 2. Potable Water Contact Approval: NSF certification for use on structures holding potable water, based on testing in accordance with NSF 61.
- H. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- I. Fiber Reinforcement: Synthetic fiber shown to have long-term resistance to deterioration when exposed to moisture and alkalis; 1/2 inch length.

2.04 Admixtures

- A. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.
- B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Air Entrainment Admixture: ASTM C260/C260M.
- D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- H. Accelerating Admixture: ASTM C494/C494M Type C.
- I. Retarding Admixture: ASTM C494/C494M Type B.
- J. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 Accessory Materials

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 1. Grout: Comply with ASTM C1107/C1107M.
 2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
- B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic aggregate, and activator.

2.06 Bonding and Jointing Products

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
- C. Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.
- D. Waterstops: Rubber, complying with COE CRD-C 513.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
- E. Waterstops: PVC, complying with COE CRD-C 572.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
- F. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
 - 1. Size: As indicated on drawings.
- G. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
- H. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
 - 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - 2. Height: To suit slab thickness.

2.07 Curing Materials

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- C. Curing and Anti-Spalling Compound: Boiled linseed oil compound.
 - 1. Application: Use on roadway, bridge deck, parking deck, and ramps.
- D. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
 - 1. Vehicle: Water-based.
 - 2. Solids by Mass: 25 percent, minimum.
 - 3. VOC Content: OTC compliant.
- E. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, nonyellowing acrylic; complying with ASTM C1315 Type 1 Class A.
 - 1. Vehicle: Solvent-based.
 - 2. Solids by Mass: 25 percent, minimum.
 - 3. VOC Content: Ozone Transport Commission (OTC) compliant.

- F. Moisture-Retaining Sheet: ASTM C171.
 - 1. Curing paper, regular.
 - 2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 - 3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- G. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- H. Water: Potable, not detrimental to concrete.

2.08 Concrete Mix Design

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
 - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
 - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- E. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch or as indicated on drawings.
 - 2. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 - 3. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
 - 4. Cement Content: Minimum 5 sacks per cubic yard.
 - 5. Water-Cement Ratio: Maximum 59 percent by weight.
 - 6. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
 - 7. Maximum Slump: 4 inches.
 - 8. Maximum Aggregate Size: 5/8 inch.

2.09 Mixing

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 Examination

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 Preparation

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 Installing Reinforcement and Other Embedded Items

- A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
- B. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 Placing Concrete

- A. Place concrete in accordance with ACI PRC-304.
- B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- E. Finish concrete within the tolerances specified below.

3.05 Slab Jointing

- A. Locate joints as indicated in the geotechnical report unless otherwise shown on the drawings.

- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- D. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.
- E. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Conform to manufacturer's requirements for joint sealer finish.

3.06 Concrete Finishing

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
 - 2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
 - 3. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.07 Curing and Protection

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
 - 2. High early strength concrete: Not less than four days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
 - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 Field Quality Control

- A. An independent testing agency will perform field quality control tests.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.

- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 Defective Concrete

- A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.10 Schedule - Concrete Types and Finishes

- A. Structural Walls: 3,000 psi 28 day concrete or as indicated on drawings.

END OF SECTION

PRECAST STRUCTURAL CONCRETE**PART 1 GENERAL****1.01 Section Includes**

- A. Circular or box culverts.
- B. Structural walls.
- C. Grout packing.
- D. Connection and supporting devices.

1.02 Price and Payment Procedures

- A. Precast Column and Beam Members:
 - 1. Structural Walls: By the face foot.
 - 2. Culverts: By the linear foot.
 - 3. Includes unit member placed and anchored.

1.03 Reference Standards

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- E. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- F. ASTM A416/A416M - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete; 2012a.
- G. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- I. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- J. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- K. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2007b (Reapproved 2014).
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- M. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel Bars; 2001 (Reapproved 2007).
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- O. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 1999, Fourth Edition.

- P. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; 2010, Seventh Edition.
- Q. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988, Second Edition.
- R. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete; 1989, Second Edition.
- S. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.
- T. UL (FRD) - Fire Resistance Directory; current edition.

1.04 Submittals

- A. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.
- B. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.
 - 1. Submit reviewed shop drawings and design data to Engineer.

1.05 Quality Assurance

- A. Designer Qualifications: Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section.
- C. Erector Qualifications: Company specializing in erecting products of this section.
- D. Welder Qualifications: Qualified in accordance with AWS D1.1 and AWS D1.4.

1.06 Delivery, Storage, and Handling

- A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.
- B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- C. Protect members to prevent staining, chipping, or spalling of concrete.
- D. Mark each member with date of production and final position in structure.

PART 2 PRODUCTS

2.01 Manufacturers

- A. Structural Precast Concrete:
 - 1. Any manufacturer holding a PCI Group C Plant Certification for the types of products specified; see www.pci.org.

2.02 Precast Units

- A. Precast Structural Concrete Units: Comply with PCI MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-135, ACI CODE-318, and applicable codes.
 - 1. Design components to withstand dead loads and design loads in the configuration indicated on the drawings.

2. Calculate structural properties of framing members in accordance with ACI CODE-318.
3. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with strength requirements.
4. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.
5. Design system to accommodate construction tolerances, deflection of other structural members and clearances of intended openings.

2.03 Materials

- A. Cement: White Portland type, complying with ASTM C150/C150M, Type I.
- B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116.

2.04 Reinforcement

- A. Tensioning Steel Tendons: ASTM A 416/A 416M, Grade 250 (1725) or 270 (1860); seven-wire stranded steel cable; full length without splices.
- B. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280).
 1. Plain or deformed billet-steel bars.
 2. Unfinished.
- C. Steel Welded Wire Reinforcement: ASTM A 185/A 185M plain type; in flat sheets or coiled rolls.

2.05 Fabrication

- A. Comply with fabrication procedures specified in PCI MNL-116.
- B. Fabricate and handle epoxy-coated reinforcing bars in accordance with ASTM D3963/D3963M.
- C. Maintain plant records and quality control program during production of precast members. Make records available upon request.
- D. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.
- E. Tension reinforcement tendons as required to achieve design load criteria.
- F. Provide required openings with a dimension larger than 10 inches and embed accessories provided under other sections of the specifications, at indicated locations.
- G. Exposed Ends at Stressing Tendons: Fill recess with non-shrink or epoxy grout, trowel flush.

2.06 Finishes

- A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.
- B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- C. Finish members to PCI MNL-116 Commercial grade.
- D. Plant Finish (Finish ___): Normal plant finish; surface may contain small surface holes caused by air bubbles, minor chips or spalling at edges or ends, without major discoloration.

- E. Exposed-to-View Finish (Finish ___): Normal plant finish with fins and protrusions removed, ground edges and ends, flat face surfaces.
- F. Rubbed Finish (Finish ___): Surface holes or bubbles over 1/4 inch filled with matching cementitious paste, fins or protrusions removed and surface ground smooth, surface then rubbed with neat cementitious paste to smooth and even color and texture.
- G. Sandblast Finish (Finish ___): Lightly sandblast to achieve partial exposure of aggregate.

2.07 Source Quality Control

- A. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.01 Examination

- A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

3.02 Preparation

- A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.03 Erection

- A. Install members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Align and maintain uniform horizontal and vertical joints, as installation progresses.
- C. Maintain temporary bracing in place until final support is provided. Protect members from staining.
- D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.
- E. Adjust differential camber between precast members to tolerance before final attachment.
- F. Install bearing pads.
- G. Level differential elevation of adjoining horizontal members with grout.
- H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.
- I. Secure units in place.

3.04 Tolerances

- A. Install members level and plumb within allowable tolerances.
- B. Conform to PCI MNL-135 for installation tolerances.
- C. When members cannot be adjusted to comply with design or tolerance criteria, cease work and advise Engineer. Execute modifications as directed.

3.05 Protection

- A. Protect members from damage caused by field welding or erection operations.
- B. Provide non-combustible shields during welding operations.

3.06 Cleaning

- A. Clean weld marks, dirt, or blemishes from surface of exposed members.

END OF SECTION

PIPE RAILING AND BRACKETS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Installation of handrail brackets.
- B. Installation of pipe railing.

1.02 RELATED REQUIREMENTS

- A. Section 05 1200.20 - Metal Work
- B. Section 09 9000 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. ASTM A 53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

1.04 SUBMITTALS

- A. Submit shop drawings to the Engineer to indicate compliance with specifications. Show locations, methods of supporting, methods of anchoring and finishes.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Pipe Railing: Shop fabricated black iron pipe of size, shape and detail indicated on the drawings. ASTM A 53, Type E or S, Grade B, Schedule 40.
 - 1. Preassemble items in shop to greatest extent possible, so as to minimize field splicing and assembly of units at project site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
 - 2. Use materials of size and thicknesses shown or if not shown of required size and thickness to produce adequate strength and durability in finished product for intended use. Work to dimensions shown or checked on shop drawings, using proven detail of fabrication and support.
 - 3. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.
 - 4. Weld corners and seams continuously.
 - 5. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces
 - 6. Join posts and rails by mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints and grinding smooth.
 - 7. Railings may be bent at corners instead of joining provided bends are uniformly formed in jigs with cylindrical cross-section of pipe maintained throughout entire bend.
 - 8. Anchor posts in concrete by means of 4" long pipe sleeves set and anchored into concrete. Provide sleeves of galvanized, standard weight, steel pipe, not more than 1/2" greater than the outside diameter of inserted pipe post.
- B. Finish: Shop prime paint interior, galvanize exterior.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Adjust railing prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 5 feet on centers. Plumb posts in each direction.
- B. Anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Set posts in sleeves and fill annular space between post and sleeve solid with molten lead and sulphur or a quick setting hydraulic cement.
- C. Anchor rail ends to concrete and masonry with steel round flanges anchored into wall construction with lead expansion shield and bolts.
- D. Space brackets one foot from each end of handrail and not over five foot on centers throughout run.
- E. Securely anchor brackets to wall to resist a horizontal load of 300 lbs.
- F. Immediately after erection, clean and brush field welds, bolted connections, and abraded areas of shop paint and paint all exposed areas with same material as used for ship painting.
- G. Sand field welds and abraded areas which will be exposed in the finish work.
- H. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils in accordance with Section 09 9000.

END OF SECTION

METAL WORK**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Work includes metal fences and gates, railings and handrails, all welding and splicing, grinding, cleaning, and preparation for finish.

1.02 RELATED REQUIREMENTS

- A. Section 05 1200.10 - Pipe Railing and Brackets
- B. Section 09 9000 - Painting and Coating

1.03 REFERENCES AND STANDARDS

- A. The following references and standards are hereby made a part of this Section and shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements or government rules and regulations.
 - 1. "Code for Arc and Gas Welding in Building Construction" of American Welding Society, AWS D1.0, latest edition with current supplements and addenda.
- B. Reference Standards
 - 1. American Society for Testing and Materials (ASTM): A36 Specifications for Structural Steel.
 - 2. A500-73 Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 3. American Institute of Steel Construction (AISC): Standard for Details and Connections of Structural Steel.

1.04 SUBMITTALS

- A. Shop Drawings
 - 1. Submit complete and accurately detailed steel shop drawings to Engineer for review. Detail steel in accordance with requirements of AISC.
 - a. Indicate types and grades of steel.
 - b. Indicate relationship to adjacent construction (walls, etc.).
 - c. Provide certified mill reports on steel.
 - d. Indicate splices and splicing methods.
 - e. Indicate all fasteners and hardware.
- B. Samples
 - 1. Submit two samples of each finished steel shape to Owner. Assemble one set of samples with required welds or fasteners to demonstrate fitting. Do not fabricate steel until samples are approved by Owner.

1.05 PRODUCT HANDLING

- A. Deliver iron and steel to site with identification tags securely wired into place. Store steel to prevent damage and protect from corrosion and deformation.

PART 2 PRODUCTS**2.01 STEEL**

- A. Structural Steel: Clean and free from rust, scale, or coating that will reduce bond. Steel shall conform to dimensional requirements, straightness, and flatness of face.

- B. Fastenings (General): Furnish all bolts, nuts, screws, clips, washers, and any other fastenings necessary for proper erection of items specified herein. For Ferrous Metal, use stainless steel or galvanized on exterior.

PART 3 EXECUTION

3.01 CONDITION OF SURFACES

- A. Inspect all surfaces to receive site metal work and report all defects which would interfere with this installation. Starting work implies acceptance of surfaces as satisfactory.

3.02 WORKMANSHIP

- A. General Requirements
 - 1. Verify all measurements at job.
 - 2. Coordinate all metal work with adjoining work for details of attachment, fittings, etc. Do all cutting, shearing, drilling, punching, threading, tapping, etc., required for the work or for attachment of adjacent work. Drill or punch holes; do not use cutting torch. Shearing and punching shall have true lines and surfaces.
 - 3. Conceal all fastenings where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Form joints exposed to weather to exclude water.
 - 4. Make all permanent connections in ferrous metal surfaces using welds where at all possible; do not use bolts or screws where they can be avoided.
 - 5. Provide all lugs, clips, anchors, and miscellaneous fastenings necessary for the complete assembly and installation.
 - 6. Set all work plumb, true, right, and neatly trimmed out. Miter corners and angles of exposed moldings and frames unless otherwise noted.
 - 7. Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progresses of work is not delayed. Be responsible for proper location of such items.
- B. Welding
 - 1. Welds shall be made only by operators experienced in performing the type of work indicated.
 - 2. Welds normally exposed to view in the finished work shall be uniformly made and shall be ground smooth.
- C. Bolted, and Screwed Connections
 - 1. In general, use bolts for field connections only and then only as detailed. Provide washers under all heads and nuts bearing on wood. Draw all nuts tight and nick threads of permanent connections to prevent loosening. Use beveled washers where bearing is on sloped surfaces.
 - 2. Where screws must be used for permanent connections in ferrous metal, use flat headed type, countersunk, with screw slots filled and finished smooth and flush.

3.03 PROTECTION AND CLEANING

- A. Remove all soil and foreign matter from finished surfaces and apply such protective measures as may be required to prevent damage or discoloration of any kind until acceptance of project by Owner.

END OF SECTION

PAINTING AND COATING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 6. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 7. Glass.
 - 8. Concrete masonry in utility, mechanical, and electrical spaces.
 - 9. Acoustical materials, unless specifically so indicated.
 - 10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 32 1723.13 - Painted Pavement Markings.

1.03 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- D. GreenSeal GS-11 - Paints, Coatings, Stains, and Sealers; 2015.
- E. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.
- F. USGBC LEED-NC - LEED Green Building Rating System for New Construction and Major Renovations; 2016.

1.05 SUBMITTALS

- A. Product Data: Provide data on all finishing products and special coatings, including VOC content.
- B. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded.

- C. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Coatings: 1 gallon of each color and type; store where directed.
 - 2. Label each container with color and type in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified.
- B. Applicator Qualifications: Company specializing in performing the type of work specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Chemical Content: The following compounds are prohibited:
1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.
- D. Flammability: Comply with applicable code for surface burning characteristics.
- E. Colors: As indicated on drawings or as required by local jurisdictional authority.

2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is suitable.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing coatings that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply latex based or compatible sealer or primer.
- I. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
- J. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- K. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- L. Copper Surfaces to be Painted: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
- M. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- N. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- O. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- P. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.

- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SITE CLEARING**PART 1 GENERAL****1.01 Section Includes**

- A. Clearing and grubbing.
- B. Selective removal and trimming.
- C. Debris removal.

1.02 Related Requirements

- A. Section 01 5713 - Temporary Erosion and Sediment Control.
- B. Section 02 4100.10 - Site Demolition.
- C. Section 31 1000.10 - Tree Protection.
- D. Section 31 2200 - Grading.
- E. Section 31 2323 - Fill.

1.03 REFERENCE STANDARDS -- NOT USED**1.04 SUBMITTALS -- NOT USED**

- A. Clearing Firm Qualification Statement: Documentation of specialized experience.

1.05 Quality Assurance

- A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- B. State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.
- C. Contractor shall not clear site until a permit is obtained from the authorized regulatory agency.
- D. Air pollution caused by dust and dirt shall be controlled and comply with governing regulations.

PART 2 PRODUCTS**PART 3 EXECUTION****3.01 Examination**

- A. Remove from site and satisfactorily dispose of all trees, shrubs, stumps, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences and miscellaneous other structures required to permit construction of new work.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 Preparation

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain and pay for required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are to remain.

3.03 Clearing and Grubbing

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, landscape areas, and planting beds.
- B. Clear site after relocating vegetation in accordance with ANSI A300 Part 6.
- C. Do not remove or damage vegetation beyond limits indicated on drawings.
- D. Install substantial, highly visible chain link or orange mesh fences at least 4 feet high to prevent inadvertent damage to vegetation at the removal limits. Reference tree protection detail in drawings.
- E. In areas where vegetation must be removed but no construction will occur, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, unless indicated on drawings.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; completely remove stumps and roots to depth of 6 inches below subgrade.
 - 4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
- H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner. Contractor shall warrant damaged vegetation for 18 months.

3.04 Selective Removal and Trimming

- A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.
- B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

3.05 Removed Vegetation Processing

- A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.
- B. Trees: Sell if marketable.

3.06 Debris Removal

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and windblown debris from public and private lands.

END OF SECTION

TREE PROTECTION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Protection of Existing Trees.

1.02 RELATED REQUIREMENTS

- A. Section 02 41 00 - Demolition
- B. Section 31 1000 - Site Clearing
- C. Section 31 2200 - Grading

1.03 PRICE AND PAYMENT PROCEDURES

- A. Tree Protection Fence: By the linear foot. Includes chain link or plastic mesh fence, posts, tie wire, and installation.

1.04 REFERENCE STANDARDS

- A. ANSI A300-2008 Pruning.
- B. Local Municipal Code.

1.05 SUBMITTALS -- NOT USED**1.06 QUALITY ASSURANCE**

- A. Employ certified arborist or landscape architect to supervise or perform tree protection work as required.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Tree Protection Fence: 4 feet high galvanized chain link.
 - 1. Posts: 1-1/2 inch at 6 feet on center, 2 feet deep.
 - 2. Tension Wire: Not less than 12 gauge at top and 6 inches above existing grade.
- B. Tree Protection Fence: 4 feet high heavy gauge orange plastic mesh with 2" openings.
 - 1. Posts: "T" posts at 6 feet on center, 2 feet deep.

PART 3 EXECUTION**3.01 TREE PROTECTION FENCE**

- A. Install at Root Protection Zone of all existing trees to be protected as shown on drawing.
- B. Root Protection Zone shall be located 1 foot radius from trunk for every 1 inch diameter of trunk at 4 feet from ground. The diameter of a multi-trunk tree is calculated as the sum of the largest trunk plus half of the sum of additional trunks at 4.5 feet from ground.
- C. Fence may be located a minimum of half of the root protection radius if approved by the regulatory authority, Engineer, or Owner.
- D. Fence Location Detail: See detail as shown on drawings.

3.02 TREE PROTECTION REQUIREMENTS

- A. Install tree protection fence prior to any clearing, excavation, or grading and maintain in good repair for the duration of all construction work unless otherwise directed.
- B. No construction operations are allowed within the Root Protection Zone.

- C. Root Protection Zone shall be sustained in a natural state and shall be free from vehicular or mechanical traffic; no fill, equipment, liquids, or construction debris shall be placed inside the protective barrier.
- D. Root Protection Zone shall be covered with 6" of mulch to reduce moisture stress.
- E. The proposed finished grade and elevation of land within the Root Protection Zone of any trees to be preserved shall not be raised or lowered more than 3 inches. Welling and retaining methods are allowed outside the Root Protection Zone.
- F. Root Protection Zone shall remain pervious, i.e. ground cover or turf at completion of landscape design.
- G. No roots may be cut closer than 6 feet from the base of any tree. Roots cut within the Root Protection Zone will only be allowed on one side of the tree. Any roots that need to be cut within the Root Protection Zone will be cut using a saw-type trencher, and all cut roots will be painted.
- H. All trees impacted by construction shall be fertilized with an organic tree fertilizer prior to construction and again at the end of construction. The area within the protective fencing shall be mulched with about 6 inches of mulch. Water barrels shall be placed within the Root Protection Zone to irrigate these trees if necessary.
- I. No trash or warming fires shall be placed within 50 feet of any tree.
- J. No pedestrian traffic shall occur within dripline of any tree.

3.03 DAMAGE TO PROTECTED TREES

- A. Trim trees and shrubs when doing so will prevent removal or damage. Trimmed or damaged trees shall be treated or repaired under supervision of a certified arborist or landscape architect.
- B. Any damage done to existing tree crowns or root systems shall be repaired immediately under supervision of a certified arborist. All wounds to oaks shall be painted with pruning paint within 20 minutes after damage. Roots exposed during construction operations will be cut cleanly. Cut surfaces shall be painted and topsoil and mulch placed over exposed root area immediately.
- C. Branch Pruning Detail: See detail as shown on drawings.
- D. Contractor shall compensate owner for damage to existing trees designated to remain in the amount of \$200 per caliper inch measured 4 feet from ground. This amount will be deducted from final payment.

END OF SECTION

GRADING**PART 1 GENERAL****1.01 Section Includes**

- A. Removal of topsoil.
- B. Rough grading the site.
- C. Fine grading.
- D. Finish grading.

1.02 Related Requirements

- A. Section 31 1000 - Site Clearing.
- B. Section 31 1000.10 - Tree Protection.
- C. Section 31 2316 - Excavation.
- D. Section 31 2323 - Fill.
- E. Project Geotechnical Report.

1.03 Price and Payment Procedures

- A. Topsoil:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: scarifying substrate surface, placing where required, and compacting.

1.04 Submittals

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 Quality Assurance

- A. Perform Work in accordance with available geotechnical engineering and landscape specifications.

PART 2 PRODUCTS**2.01 Materials**

- A. Gravel: Excavated on-site.
 - 1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.
- B. Topsoil: Topsoil excavated on-site; friable loam, imported borrow; local borrow.
 - 1. Graded.
 - 2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
- C. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION**3.01 Examination**

- A. Verify survey bench mark and intended elevations for grading areas are as indicated.
- B. Verify the absence of standing or ponding water.

3.02 Preparation

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.

- C. Locate, identify, and protect above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, and fences.
- G. Protect trees to remain. Reference Section 31 1000.10.
- H. Protect features to remain as a portion of final landscaping.

3.03 Rough Grading

- A. Excavate and fill subgrade material to elevations indicated on plans.
- B. Remove topsoil from areas to be further excavated, without mixing with foreign materials.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from areas to be further excavated.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. See Section 31 2323 for filling procedures.
- H. Benching Slopes: Horizontally bench slopes greater than 4:1 to key fill material to slope for firm bearing.
- I. Replace displaced subgrade in accordance with Section 31 2323.
- J. Remove and replace unsuitable materials as specified fill.

3.04 Fine Grading

- A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

3.05 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.06 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1-1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil in areas indicated on drawings.

- F. If not otherwise indicated, place topsoil to the following compacted thicknesses:
 - 1. Areas to be Seeded with Grass: 4 inches.
 - 2. Areas to be Sodded: 4 inches.
- G. Place topsoil during dry weather.
- H. Remove roots, weeds, rocks, and foreign material while spreading.
- I. Near plants, buildings, and curbs spread topsoil manually to prevent damage.
- J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- K. Lightly compact placed topsoil.
- L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.07 Tolerances

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface: Plus or minus 1/2 inch.

3.08 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Engineer as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.09 FIELD QUALITY CONTROL

- A. See Section 31 2323 for compaction density testing.

3.10 Cleaning

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.
- C. Leave site clean and raked, ready to receive work.

END OF SECTION

EXCAVATION**PART 1 GENERAL****1.01 Section Includes**

- A. Excavating for site grading, paving, structures.
- B. Trenching for utilities from 5 feet outside the building to utility main connections.
- C. Excavation.

1.02 Related Requirements

- A. Section 01 5713 - Temporary Erosion and Sediment Control.
- B. Section 31 2200 - Grading.
- C. Section 31 2323 - Fill.
- D. Section 31 2316.13 - Trenching.
- E. Section 31 2316.14 - Trench Excavation Protection.
- F. Project Geotechnical Report.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Excavating Soil Materials:
 - 1. Measurement method: By the cubic yard measured before removal.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 Examination**

- A. Verify survey bench mark elevations are as indicated on drawings.
- B. Verify that existing topography is as shown in the plans. Coordinate with the engineer for any discrepancies prior to start of excavation.

3.02 Preparation

- A. Identify required lines, levels, contours, and datum locations.
- B. Excavate and backfill, in advance of construction, test pits to determine conditions or location of existing utilities.
- C. Locate and identify known utilities to remain and protect from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, curbs, and existing utilities from excavating equipment and vehicular traffic. Repair damage at no additional charge to Owner, including utility company charges.
- F. Protect plants, lawns, rock outcroppings, and other features to remain.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.03 Excavation

- A. General Excavation:
 - 1. Excavate to indicated contours, elevations, and grades.

- B. Excavate to accommodate construction operations and to lines and grades indicated on the drawings.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Excavate to provide adequate work space and clearance for concrete forms. Do not undercut excavation face for extended footings.
- E. Steep slope and trench excavations shall conform with OSHA standards for shoring and safety protection.
- F. Do not interfere with 45-degree bearing splay of foundations.
- G. Cut utility trenches wide enough to allow inspection of installed utilities. Reference Sections 31 2316.13 and .
- H. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- I. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- J. Stockpile excavated material to be re-used in area designated on site.
- K. Remove excess excavated material from site. Transport and place in accordance with all applicable regulations. Do not dispose of excess material in any stream or watercourse. Do not dump excess material on public property. Do not dispose of excess material on private property unless authorized by Owner.
- L. Structure and Roadway Excavations:
 - 1. Subgrade shall be firm, dense, and compacted to 95 percent maximum density at a moisture content between optimum and optimum plus or minus 4 percent unless otherwise indicated in the Project Geotechnical Report.
 - 2. Bottom of excavations for footings and slabs shall be level, clean, dry, and clear of loose material.
 - 3. Remove unsuitable material and replace with suitable material as required or directed by Testing Laboratory.
 - 4. Refill over-excavated areas with properly compacted select backfill material.
 - 5. Extend excavation 5 feet minimum on each side of structure or footing unless otherwise indicated on drawings.
 - 6. Proof roll exposed design subgrade using a 25 ton pneumatic tire roller, maintaining a minimum tire pressure of 75 psi. Proof rolling operation shall be inspected by Testing Laboratory. Any soft or unconsolidated zones or areas detected by proof rolling operations shall be undercut as directed by the Engineer or the Testing Laboratory. Undercut subgrade shall be scarified to a minimum depth of six inches and compacted to a minimum of 95 percent maximum density at a moisture content between optimum and optimum plus 4 percent unless otherwise indicated in the Project Geotechnical Report. After the undercut subgrade has been scarified and compacted, the undercut shall be backfilled with select backfill to the design subgrade elevation. The final subgrade shall be reviewed by the Engineer or the Testing Laboratory.
 - 7. The surface of the subgrade for street excavations shall be finished to the lines and grades as established, and be in conformity with the typical sections shown on the plans. Any deviation in excess of one-half inch in cross section, and in a length of sixteen feet,

measured longitudinally, shall be corrected by loosening, adding, or removing material, reshaping and compacting by sprinkling and rolling.

3.04 Field Quality Control

- A. Provide access for visual inspection of loadbearing excavated surfaces by Engineer before proceeding with work.

3.05 Protection

- A. Divert surface water away from excavations.
- B. Maintain stability of banks and loose soils; prevent from falling into excavations.
- C. Maintain excavations in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and exposed soil against physical disturbance, rain, and freeze.
- E. Keep excavations free of standing water and completely free of water during concrete placement.
- F. Protect footing excavations; construct concrete footings same day excavation is made wherever possible.

END OF SECTION

TRENCHING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Trench excavation.
- B. Backfill and compaction.
- C. Excavating, backfilling and compacting for utilities outside of any structure to utility main connections or storm drainage outfalls.

1.02 RELATED REQUIREMENTS

- A. Project Geotechnical Report.
- B. Section 03 3000.10 - Controlled Low Strength Backfill.
- C. Section 31 2200 - Grading.
- D. Section 31 2316 - Excavation.
- E. Section 31 2323 - Fill.
- F. Section 31 2316.14 - Trench Excavation Protection.
- G. Section 33 4600 - Subdrainage.

1.03 Price and Payment Procedures

- A. Unit Prices:
 - 1. See Section 01 2200 - Unit Prices for additional requirements.
 - 2. Basis of Measurement for Trenching: By linear foot.
- B. Excavating Soil Materials:
 - 1. Measurement method: By the cubic yard.
 - 2. Includes: Excavating to required elevations, loading and placing materials in stockpile or removing from site.
 - 3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.
- C. General Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- D. Structural Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.
- E. Granular Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- F. Aggregates:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

- A. Finish Grade Elevations: Top of paving or proposed contours indicated on drawings.
- B. Subgrade Elevations: Bottom of paving section indicated on drawings.

1.05 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- J. TxDOT TEX-113-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials; 2010.
- K. TxDOT TEX-114-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade, Embankment Soils, and Backfill Material; 2005.
- L. NFPA 24 - Installation of Private Fire Service Mains and their appurtenances.

1.06 Submittals

- A. Samples: sample of each type of fill; submit each material sample in three 5-gallon air-tight containers to testing laboratory.
- B. Source Quality Control Submittals: Submit name of imported materials source.
 - 1. Results of gradation tests on proposed and actual materials used.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

1.07 Delivery, Storage, and Handling

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver fill to project site in advance of need.

- C. When fill materials need on-site storage, locate stockpiles where indicated on drawings.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
 - 4. Provide positive drainage away from stockpiled material.
 - 5. Install erosion control measures around stockpiles as needed.

PART 2 PRODUCTS

2.01 Fill Materials

- A. General Fill: Comprised of sand and gravel; free of shale, clay, friable materials, and debris.
- B. General Fill: Subsoil excavated on-site or imported borrow.
 - 1. For imported borrow, gradation less than 15 percent passing No. 200 sieve as determined by ASTM D 1140.
 - 2. For imported borrow, plasticity index less than 20 percent as determined by ASTM D 4318.
 - 3. No organic matter or debris.
 - 4. For subsoil excavated onsite, reference Geotechnical Engineering Report.
- C. Structural Fill:
 - 1. Reference Geotechnical Engineering Report.
 - 2. If a Geotechnical Engineering Report is not available then comply with TxDOT Item 247 Type A Grade 2 Base.
 - 3. Graded in accordance with the following limits unless otherwise indicated:
 - a. 1-3/4 inch sieve: 90-100 percent passing.
 - b. No. 4 sieve: 25-55 percent passing.
 - c. No. 40 sieve: 15-40 percent passing.
 - 4. Mixture shall be crushed stone and contain no clay lumps or organic matter.
 - 5. Fraction passing No. 40 sieve shall have a liquid limit less than 40 and a plasticity index less than 12 as determined by ASTM D 4318.
- D. Concrete for Fill: As specified in Section 03 3000.10 - Controlled Low Strength Backfill.
- E. Granular Fill : Crushed limestone or pea gravel ; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM C136/C136M, within the following limits:
 - a. 1/2 inch sieve: 95 percent passing.
 - b. No. 4 sieve: 5 percent passing.
- F. Select Initial Backfill or Bedding Material: Clean, well graded crushed stone or gravels, crushed screenings or sand.
 - 1. Modified Grade 5:
 - a. 1/2 inch sieve: 100 percent passing.
 - b. 3/8 inch sieve: 100 to 95 percent passing.
 - c. No. 4 sieve: 80 to 20 percent passing.
 - d. No. 10 sieve: less than 25 percent passing.
 - e. No. 20 sieve: less than 2 percent passing.
 - 2. Plasticity index 12 or less as determined by TxDOT Test Method TEX-106-E.

2.02 Accessories

- A. Geotextile Fabric: Non-biodegradable.

2.03 Source Quality Control

- A. Test fill materials in accordance with specified standard before delivery to site.
- B. Nonconforming Materials: Change and retest.
- C. Provide materials of each type from same source or as directed by Engineer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.

3.02 Preparation

- A. Locate and identify existing utilities to remain as indicated on drawings and protect from damage.
- B. Notify utility company to remove and relocate utilities as indicated on plans.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect other features to remain.
- E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer.

3.03 TRENCHING

- A. Grade top perimeter of excavation to prevent surface water collection.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume.
- C. General: Cut trenches neat and clean.
 - 1. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Utility Preparation: Rake trench bottom to uniform grade.
 - 1. Remove unsuitable subgrade and backfill.
 - 2. Compact subgrade to density equal to or greater than subsequent fill material requirements.
- E. Maintain trenches and prevent loose soil or rocks from entering.
- F. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- G. Banks of excavations may be cut back on slopes to angle of repose or less until shored. Slope shall not extend lower than 12 inches above top of pipe.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Cut trenches wide enough to allow proper installation, jointing, embedment, and inspection of utilities. See drawing details for minimum trench width.
- J. Hand trim excavations. Remove loose matter.

- K. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- L. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 2316.26 for removal of larger material.
- M. Excavate pipe trenches six inches (6") below the underside of the pipe to provide for the installation of a granular fill pipe foundation material except where otherwise required.
- N. Where in earth, trench bottoms for pipe six inches (6") or smaller, may be graded to provide uniform and continuous support (between bell holes or end joints) of the installed pipe.
- O. Remove excavated material that is unsuitable for re-use from site.
- P. Stockpile excavated material to be re-used in area designated on site. Stockpile material a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins.
- Q. Remove excess excavated material from site.
- R. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- S. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.

3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with properly compacted structural fill.
- B. Backfill over-depths in trench excavation with properly compacted structural fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Provide adequate clearance at bell holes for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
- E. Where existing piping constructed by others cross the new pipeline trench excavation, the existing piping or ductbank shall be adequately supported and protected from damage due to construction. All methods for supporting and maintaining these facilities shall be subject to review by the Engineer or the Testing Laboratory. Backfill between utility crossings shall meet the requirements of standard backfill compact. See Section 03 3000.10 for low strength flowable fill option.
- F. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation. Prevent surface water from flowing into trenches. Any water accumulating in trenches shall be removed by pumping or other approved methods.
- G. If this project is within the Edwards Aquifer Recharge Zone, follow all requirements and recommendations of approved Water Pollution Abatement Plan (WPAP) and Sewer Collection System (SCS), including, plans, reports, and TCEQ approval letters. If, during construction, any recharge features are found, all activities near the feature must be suspended immediately and the Engineer must be notified. No activities near the feature may proceed until TCEQ has approved a plan to address the feature. If any sanitary sewer lines cross geologic fault lines,

as indicated in the SCS plans and report, contact the Engineer 48 hours prior to excavating in the vicinity of the fault. The Engineer's geologist is required to assess such faults during excavation.

3.05 BACKFILLING

- A. See Section 31 2323 for general backfill requirements.
- B. Backfill is divided into three (3) separate zones:
 - 1. Bedding: The material in trench bottom in direct contact with the bottom of the pipe.
 - 2. Initial backfill: The backfill zone extending from the surface of the bedding to a point one foot (1') above the top of the pipe.
 - 3. Secondary backfill: The backfill zone extending from the initial backfill surface to the top of the trench. Placement of materials for each of the zones is described herein.
- C. Bedding
 - 1. When unacceptable materials such as water, silt, muck, trash or debris, or rock boulder or coarse gravel (particle size greater than 1 ¾ inch) exist at the bearing level or for pipes with a nominal inner diameter greater than six inches (6"), use a bedding of granular embedment material.
 - 2. Unstable materials shall be removed at the direction of the Engineer and replaced to a minimum depth of four inches (4") or one-eighth (1/8) of the outside diameter of the pipe, whichever is greater, with granular embedment material. Extend this material up to the sides of the pipe sufficiently to embed the lower quadrant of the pipe. If stability is not accomplished by using the above procedure, the Engineer may require additional granular embedment.
 - 3. Spread and grade granular embedment to provide a uniform and continuous bedding zone beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface to withdraw pipe slings or other lifting tackle. After each pipe has been graded, aligned, and shoved home, deposit and compact sufficient pipe embedment material under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations. Deposit and compact embedment material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
 - 4. Compact each layer of embedment material by at least two complete coverages of all portions of the surface of each lift using adequate compaction equipment. One coverage is defined as the conditions reached when all portions of the lift fill have been subjected to the direct contact of the compacting surface of the compactor.
 - 5. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.
- D. Initial Backfill: Initial backfill is defined as backfill having a thickness in its compacted state from the surface of the bedding to a point one foot (1') above the top of the pipe. Initial backfill shall be constructed in accordance with details shown on the plans and these specifications.
 - 1. Select Initial Backfill: Where pipe is to be laid in a rock cut or where rock in boulder ledge or coarse gravel (particle size larger than 1¾ inch) formations exist in the initial backfill zone, or where trench walls or conditions are unstable or where the pipe to be laid is flexible pipe, use granular embedment for initial backfill.

2. For conduits less than twenty-four inches (24") in diameter select initial backfill material shall be placed in two (2) lifts. The first lift shall be spread uniformly and simultaneously on each side and under the shoulders of the pipe to the mid-point or spring line of the pipe. The first lift of select initial backfill shall be inspected and approved prior to placement of the second lift. The second lift of select initial backfill material shall extend from the spring line of the pipe to a depth sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe. The second lift shall be evenly spread in a similar manner as the first lift.
 3. For conduits twenty-four (24") in diameter and larger, select initial backfill material shall be evenly and simultaneously spread alongside, under the shoulders or haunches of the pipe and over the pipe in six-inch (6") lifts to a point sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe.
 4. Natural Initial Backfill: Where the pipe to be laid is rigid pipe and where stable materials and laying conditions exist at the pipe bearing level and initial backfill zone and existing excavated materials are acceptable to the Engineer, such excavated natural materials may be utilized as initial backfill material.
 5. For dedicated water lines used for fire protection and trenched in rock, tamped initial backfill and bedding material shall be used for at least 6 inches under and around the pipe and for at least 2 feet above the pipe.
- E. Secondary Backfill: Secondary backfill is defined as backfill from one foot (1') above the top of the pipe of the trench. Secondary backfill shall be constructed in accordance with details shown on the plans and these specifications.
1. Secondary backfill shall generally consist of materials removed from the trench and shall be free of trash brush and other debris. No rock or stones having any dimension larger than one half of the trench width, or four inches (4"), whichever is less, shall be used in the secondary backfilling zone. In special cases where excessive width and/or depth of the trench permit, and only with approval of the Engineer, larger rocks up to six inches (6") in diameter may be incorporated into the backfill provided that the surrounding compactable soil may be properly and adequately compacted.
- F. General Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.
- G. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- H. Restore the surface of the backfilled trench, if not disturbed by surrounding construction, to match previous existing conditions.
- I. Compaction Density unless otherwise indicated in the project Geotechnical Report:
1. Compaction to meet the requirements of TxDOT TEX-114-E.
 2. Lift Thickness: 8 inches.
 3. Moisture Content: Between optimum and optimum +4 percent.
 4. Testing laboratory will perform density tests at completion of each lift.
 5. If the tests indicate unsatisfactory compaction, the Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction work shall be performed by the Contractor at no additional cost to the Owner until the specified compaction is obtained. This work shall include complete removal of unacceptable (as determined by the Testing Laboratory) fill areas and replacement and recompaction until acceptable fill is provided.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.

3.07 Tolerances

- A. Maximum Variation from Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 Cleaning

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Stockpile excavated material re-used in area designated on-site; see Section 31 2200.
- C. Remove excavated material unsuitable for re-use from site.
- D. Remove excess excavated material from site.
- E. Leave unused materials in a neat, compact stockpile.
- F. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- G. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

TRENCH EXCAVATION PROTECTION**PART I - GENERAL****1.01 SECTION INCLUDES:**

- A. Trench Excavation Protection required for the construction of all trench excavation protection systems to be utilized in the project and including all additional excavation and backfill necessitated by the protection and backfill necessitated by the protection system.

1.02 MEASUREMENT AND PAYMENT

- A. Trench Excavation Protection is to be included in the cost of installation of trenched underground utilities.

1.03 RELATED SECTIONS

- A. Trench Excavation Protection shall be accomplished as required by the provisions of Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.
- B. A copy of the Document is available for review at the office of the Engineer. It shall be construed that this document is included in this Project Manual and shall apply to every Section as if written in full therein.

PART 2 - PRODUCTS -- NOT USED**PART 3 - EXECUTION****3.01 CONSTRUCTION METHODS**

- A. Trench Excavation Protection shall be accomplished as required by the provisions of, Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.

END OF SECTION

ROCK REMOVAL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Removal of rock during excavation.

1.02 RELATED REQUIREMENTS

- A. Section 01 5713 - Temporary Erosion and Sediment Control.
- B. Section 02 5100 - Geologic Feature Remediation.
- C. Section 31 2316 - Excavation.
- D. Section 31 2316.13 - Trenching.
- E. Section 31 2316.14 - Trench Excavation Protection.
- F. Section 31 2323 - Fill.
- G. Project Geotechnical Report.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.
- B. Trench Rock Removal: By the cubic yard measured before removal. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.04 DEFINITIONS

- A. Rock: Solid mineral material of a size that cannot be removed with a 3/4 cubic yard capacity loader bucket.

1.05 REFERENCE STANDARDS -- NOT USED**PART 2 PRODUCTS -- NOT USED****PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.03 USE OF EXPLOSIVES -- NOT USED**3.04 ROCK REMOVAL**

- A. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.
- B. Form level bearing at bottom of excavations.
- C. Remove shaled layers to provide sound and unshattered base for footings or site structures.
- D. Correct unauthorized rock removal to directions of Engineer.
- E. Vertical rock faces assumed to be competent rock as indicated on drawings shall be excavated by milling machine or rock saw. "Hoe ramming" or "ripping" will not be allowed. Unstable

vertical rock faces caused by improper rock excavation methods shall be stabilized using structural retaining materials acceptable to Owner and Engineer at no additional charge to Owner.

- F. Coordinate with Owner and Engineer for stockpiling of boulders larger than 3 feet for landscape features.
- G. If onsite excavated material is to be used as onsite fill, refer to Geotechnical Report and Section 31 2323 - Fill for requirements.
- H. Control noise and dust from on-site rock crushing and screening operations. Comply with all applicable regulations.
- I. Onsite rock crushing facilities are subject to all Local, State, and Federal codes and permits. The contractor shall obtain all necessary permits for rock crushing facilities at no additional expense to the owner.
- J. If excavation encounters a geologic feature, reference Section 02 5100.

END OF SECTION

DEWATERING

PART 3 EXECUTION

1.01 Installation

- A. Prevent fine sands from entering system or discharge.

1.02 Operation

- A. Operate system continuously or as directed by Engineer.
- B. Maintain excavations free of water until foundations, underground tanks, and underground utilities are constructed.
- C. Prevent damages or disturbances to work areas from discharge water.

1.03 Water Disposal

- A. Dispose of discharge water and collected sediment as directed by Engineer.
- B. Maintain water disposal system in operating order.
- C. Prevent damages or disturbances to work areas from water disposal.

1.04 Closeout Activities

- A. Dewatering System Removal: Remove upon completion of dewatering activities.

END OF SECTION

FILL**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.
- B. Filling holes, pits, and excavations.

1.02 RELATED REQUIREMENTS

- A. Section 31 2200 - Grading.
- B. Section 31 2316 - Excavation.
- C. Section 31 2316.13 - Trenching.
- D. Section 32 9119 - Landscape Grading.
- E. Project Geotechnical Report.

1.03 PRICE AND PAYMENT PROCEDURES

- A. General Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- B. Structural Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- C. Granular Fill:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- D. Aggregates:
 - 1. Measurement Method: By the cubic yard.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- J. TxDOT TEX-113-E, Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials, using 5.5 lb rammer and 12-inch drop.

1.06 SUBMITTALS

- A. Samples: sample of each type of fill; submit each material sample in three 5-gallon air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated onsite, imported borrow.
 - 1. For imported borrow, gradation less than 15 percent passing No. 200 sieve as determined by ASTM D 1140.
 - 2. For imported borrow, plasticity index less than 20 percent as determined by ASTM D 4318.
 - 3. No vegetative matter or debris.
 - 4. No rocks larger than half of the lift thickness.
- B. Structural Fill:
 - 1. Refer to Geotechnical Engineering Report.
 - 2. If a Geotechnical Engineering Report is not available then comply with TxDOT Item 247 Type A Grade 2 Base.
 - 3. Graded in accordance with the following limits unless otherwise indicated:
 - a. 1-3/4 inch sieve: 90-100 percent passing.
 - b. No. 4 sieve: 25-55 percent passing.
 - c. No. 40 sieve: 15-40 percent passing.

4. Mixture shall be crushed stone and contain no clay lumps or organic matter.
 5. Fraction passing No. 40 sieve shall have a liquid limit less than 40 and a plasticity index less than 12 as determined by ASTM D 4318.
- C. Granular Fill : Crushed limestone or pea gravel ; free of shale, clay, friable material and debris.
1. Graded in accordance with ASTM C136/C136M, within the following limits:
 - a. 1/2 inch sieve: 95 percent passing.
 - b. No. 4 sieve: 5 percent passing.
- D. Sand - Fill Type ____: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
1. Graded in accordance with ASTM C136/C136M; within the following limits:
 - a. No. 4 sieve: 100 percent passing.
 - b. No. 200 sieve: 0 to 10 percent passing.
- E. Drain Gravel: Washed gravel.
1. Material shall have an LA abrasion number of 35 or less.
 2. Graded within the following limits:
 - a. 2 inch sieve: 100 percent passing.
 - b. 1-1/2 inch sieve: 90-100 percent passing.
 - c. 1 inch sieve: 25-55 percent passing.
 - d. 1/2 inch sieve: 0-10 percent passing.
 - e. 1/4 inch sieve: 0-5 percent passing.
- F. Topsoil: See Section 32 9119.

2.02 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Verify that existing topography is as shown in the plans. Coordinate with the engineer for any discrepancies prior to start of excavation.
- C. Identify required lines, levels, contours, and datum locations.
- D. See Section 31 2200 for additional requirements.
- E. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- F. Verify structural ability of unsupported walls to support imposed loads by the fill.
- G. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.
- E. Record locations of underground utilities.
- F. If required, remove concrete formwork.
- G. Remove trash and debris.

3.03 FILLING

- A. Fill to contours and elevations indicated using suitable materials.
- B. All select backfill, backfill and fill required for structures and trenches and required to provide the finished grades shown and as described herein shall be furnished, placed and compacted by the Contractor.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Slope grade away from building minimum 2 percent, unless noted otherwise. Make gradual grade changes. Blend slope to transition at grade changes.
- G. Correct areas that are over-excavated.
- H. All material shall be placed in horizontal loose lifts not exceeding eight inches (8") in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Each lift shall be compacted by not less than two complete coverages of the specified compactor. Select backfill shall be placed to the underside of all concrete slabs or paved areas. The fill material shall extend a minimum of five feet (5') outside the face of each structure and be twelve inches (12") below finished grade. The maximum slope of select backfill to the subgrade shall be one vertical to one and one half horizontal.
- I. Backfill around and outside of structures and over select backfill shall be deposited in layers not to exceed eight inches (8") in uncompacted thickness and mechanically compacted, using platform type tampers. Compaction of structural backfill, by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of select backfill and/or backfill by inundation with water will not be permitted. All materials shall be deposited as specified herein and as shown on the drawings.
- J. Unless otherwise indicated in the Geotechnical Report, all material shall be placed at a moisture content that falls in the range of laboratory optimum moisture content and laboratory optimum +4%. It shall be compacted to a density of 95 percent (95%) of the maximum laboratory dry density for that material as determined by TxDOT TEX-113-E. The Contractor shall provide equipment capable of adding measured amounts of water to the material to bring it to a condition within the range of the required moisture content. The Contractor shall provide equipment capable of discing, aerating, and mixing the soil to insure reasonable uniformity of moisture content throughout the material and to reduce the moisture content of the material by air drying if necessary. If the subgrade material must be moisture conditioned before compaction, the material shall be sufficiently mixed or worked on the subgrade to insure a uniform moisture content throughout the lift of material to be

compacted. Materials at moisture content in excess of the specified limit shall be dried by aeration or stockpiled for drying.

- K. No material shall be placed when free water is standing on the surface of the area where the material is to be placed. No compaction of material will be permitted with free water on any portion of the material to be compacted. No material shall be placed or compacted in a frozen condition or on top of frozen material. Any material containing organic materials or other unacceptable material previously described shall be removed and replaced with acceptable material prior to compaction.
- L. Each lift of compacted material shall be compacted by the designated number of coverages of all portions of the surface of each lift by a smooth drum vibratory roller for granular material having a static weight not less than 5,500 pounds, a sheepsfoot roller for cohesive material exerting a pressure of 250 psi on the surface of the feet, or equivalent equipment, prior to commencement of the work. One coverage is defined as the condition obtained when all portions of the surface of the backfill material have been subjected to the direct contact of the compactor. The compactor shall be operated at a forward speed not exceeding 40 feet per minute.
- M. Compaction shall be performed with equipment suitable for the type of material being placed. The contractor shall select equipment which is capable of providing the minimum density required by these Specifications. The gross weight of compacting equipment shall not exceed 7,000 pounds within a distance of ten feet (10') from the wall of any existing structure or completed structure under this contract. Equipment shall be provided that is capable of compacting in restricted areas next to structures and around piping. The effectiveness of the equipment selected by the Contractor shall be tested at the commencement of compacted material work by construction of a small section of material within the area where material is to be placed. If tests on this section of backfill show that the specified compaction is not obtained, the Contractor shall increase the amount of coverages, decrease the lift thicknesses or obtain a different type of compactor.
- N. Particular care shall be taken to compact structure backfill which will be beneath pipes, roads, or other surface construction or structures. In addition, wherever a trench passes through structure backfill, the structure backfill shall be placed and compacted to an elevation twelve inches (12") above the top of the pipe before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.
- O. The compaction requirements specified are predicated on the use of normal materials and compaction equipment. In order to establish criteria for the placement of a controlled fill so that it will have compressibility and strength characteristics compatible with the proposed structural loadings, a series of laboratory compaction and/or compressive strength tests will be performed on the samples of materials submitted by the Contractor. From the results of the laboratory tests, the final values of the required percent compaction, the allowable compaction moisture content range, and the maximum permissible lift thickness will be established for the fill material and construction equipment proposed.
- P. Compaction Density, unless otherwise specified or indicated:
 - 1. Standard: TxDOT TEX-113-E.
 - 2. Required Density: 95 percent of the maximum dry density.
 - 3. Lift Thickness: 8 inches.
 - 4. Moisture Content: Between optimum and optimum +4 percent.
 - 5. Testing laboratory will perform density tests at completion of each lift.

6. If the tests indicate unsatisfactory compaction, the Contractor shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction work shall be performed by the Contractor at no additional cost to the Owner until the specified compaction is obtained. This work shall include complete removal of unacceptable (as determined by the Testing Laboratory) fill areas and replacement and recompaction until acceptable fill is provided.
 7. Pit Run Sand Placement: Pit run sand shall be placed and compacted to the limits shown on the drawings.
 8. Drainage Gravel: Drain gravel shall be compacted in maximum 8-inch lifts with a minimum of two passes of a hand operated vibratory plate compactor weighing between 150 and 500 pounds.
- Q. Reshape and re-compact fills subjected to vehicular traffic.
- R. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS**3.05 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. Refer to the Geotechnical Engineer for general requirements for field inspections and testing.

3.07 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Leave unused materials in a neat, compact stockpile.
- C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- D. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

LIME SOIL STABILIZATION**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Excavating, treatment, and placement of lime treated subsoil mix.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation.
- B. Section 31 2323 - Fill.
- C. Section 31 2316.13 - Trenching.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Measurement Method: Lime: By the ton (2000 lbs) of the type specified.
- B. Measurement Method: Lime Treatment: By the square yard of lime/subsoil mix. Includes supplying ingredient materials, scarifying substrate surface, mixing and placing where required, compacting and curing.

1.04 REFERENCE STANDARDS

- A. AASHTO M 216 - Standard Specification for Lime for Soil Stabilization; 2005.
- B. ASTM C977 - Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization; 2010.
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- F. NLA Bull 326 - Lime-Treated Soil Construction Manual: Lime Stabilization & Lime Modification; 2004, 11th Edition.
- G. Project Geotechnical Report.

1.05 SUBMITTALS

- A. Submit mix design and materials mix ratio that will achieve specified requirements.
- B. Samples: Submit 10 lb sample of each type of fill in air-tight containers, to testing laboratory.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with NLA Bull 326.
- B. Maintain one copy on site.

1.07 FIELD CONDITIONS

- A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees F.

PART 2 PRODUCTS**2.01 MIX MATERIALS**

- A. Subsoil: Existing reused.
- B. Type A, Hydrated Lime.
- C. Type B, Commercial Lime Slurry.
 - 1. Lime: TxDOT DMS-6350 "Lime and Lime Slurry."
 - 2. Mix Design: The Engineer will determine the target lime content and optimum moisture content in accordance with TxDOT Tex-121-E.
- D. Type C, Quicklime.
- E. The Contractor shall select, prior to construction, the grade to be used and shall notify the Engineer in writing before changing from one grade to another. Lime shall be placed in slurry form only, unless written permission is granted by the Engineer and a safety and containment plan is submitted to the Engineer by the Contractor seven days prior to use. In circumstances where it would be beneficial to utilize lime for "drying" subgrade materials to expedite construction, the Contractor may request approval from the Engineer to use pelletized lime.

2.02 EQUIPMENT

- A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, and compaction of material.

2.03 LIME/SOIL MIX

- A. Mix materials in accordance with Texas Department of Transportation Item No. 260, Lime Treatment-Road Mixed.
- B. Carefully add water to the mix to achieve a consistent mixture without lumping yet not create a wet plastic consistency.
- C. Obtain approval of the mix by _____ before proceeding with placement.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not place fill over frozen, wet or soft subgrade surfaces.

3.02 EXCAVATION

- A. Protect adjacent structures from damage by this work.
- B. Excavate subsoil to depth and configuration as indicated in the drawings. Minimum depth is 6 inches.
- C. Proof roll subgrade to identify soft areas; excavate those areas.
- D. Do not excavate within normal 45 degree bearing splay of any foundation.
- E. Notify Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume work.
- F. Correct areas over-excavated in accordance with Section 31 2316.
- G. Stockpile excavated material in area designated on site; remove excess material not being reused from site.

- H. In lieu of using the cutting and pulverizing machine, the Contractor may excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the plans or as established by the Engineer.
- I. Pulverization: The existing pavement or base material shall be pulverized or scarified so that 100 percent shall pass the 2-1/2 inch sieve.

3.03 SOIL TREATMENT AND BACKFILLING

- A. Application: The percentage by weight or pounds per square yard of lime to be added will be as shown on the plans and may be varied by the Engineer if conditions warrant.
 - 1. Lime shall be spread only on that area where the mixing operations can be completed during the same working day.
 - 2. Unless otherwise approved by the Engineer, the lime operation shall not be started when the air temperature is below 40 degrees F. Lime shall not be placed when weather conditions in the opinion of the Engineer are unsuitable.
- B. Slurry Placing: When Type A Hydrated Lime is specified and slurry placement is to be used, the Type A Hydrated Lime shall be mixed with water to form a slurry with a solids content approved by the Engineer.
 - 1. Type B Commercial Lime Slurry:
 - a. Deliver to the project in slurry form at or above the minimum dry solids content approved by the Engineer.
 - b. The distribution of lime at the rate(s) shown on the plans or approved by the Engineer shall be attained by successive passes over a measured section of roadway until the proper lime content has been secured.
 - 2. Type C Quicklime:
 - a. Apply as slurry, the amount of dry quicklime shall be 80 percent of the amount shown on the plans.
 - b. The slurry shall contain at least the minimum dry solids content approved by the Engineer.
 - c. The residue from the slurring procedure shall be spread uniformly over the length of the roadway currently being processed unless otherwise approved by the Engineer.
 - 3. Slurry shall be of such consistency that it can be applied uniformly without difficulty.
 - 4. When the distributor truck is not equipped with an agitator, the Contractor shall have a standby pump available on the project for agitating the lime and water as required by the Engineer in case of undue delays in dispersing the slurry.
- C. Dry Placing: Dry placing is not allowed unless approved by the Engineer in writing.
 - 1. The lime shall be distributed by an approved spreader at the rate shown on the plans or as directed by the Engineer.
 - 2. The lime shall be distributed at a uniform rate and in such a manner as to reduce the scattering of lime by the wind.
 - 3. The material shall be sprinkled as approved by the Inspector.
- D. Mixing: The mixing procedure shall be the same for "Slurry Placing" or "Dry Placing" as herein described.
 - 1. Begin Mixing within 6 hours of lime application. During the interval between application and mixing, hydrated lime that has been exposed to the open air for a period of six (6)

hours or more or to excessive loss due to washing or blowing will not be accepted for payment.

- a. Initial Mixing: The material and lime shall be thoroughly mixed. The material and lime shall be brought to the proper moisture content and left to mellow for 1 to 4 days. When pebble grade quicklime is used, allow the mixture to mellow for 2 to 4 days as approved by the Engineer.
 - 1) If Type C Quicklime, Grade "DS," is approved for use by the Engineer under "Dry Placing," the material and lime shall be mixed as thoroughly as possible at the time of the lime application. Sufficient moisture shall be added during the mixing to hydrate the quicklime.
 - 2) During the mellowing period, the material shall be kept moist as directed by the Inspector.
 - 3) When shown on the plans or approved by the Engineer, the pulverization requirement may be waived when the material contains a substantial quantity of aggregate.
2. Final Mixing: After the required mellowing time, the material shall be uniformly mixed by approved methods. If the soil binder-lime mixture contains clods, they shall be reduced in size by the use of approved pulverization methods.
 - a. Following mixing, a sample of the material at roadway moisture will be obtained for pulverization testing. All non-slaking aggregates retained on the 3/4 inch sieve will be removed from the sample. The remainder of the material shall meet the following pulverization requirement when tested by TxDOT Test Method Tex-101-E, Part III:

1) Minimum passing 1-3/4 " sieve	100
2) Minimum passing 3/4" sieve	85
3) Minimum passing No. 4 sieve	60
- E. Compaction: Prior to compaction, the material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction of the mixture shall begin immediately after final mixing and in no case more than 24 hours after final mixing
 1. Compaction shall continue until the entire depth of the mixture is uniformly compacted. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections, lines and grades as shown on the plans or as established by the Engineer.
 - a. Ordinary Compaction: Roll with approved compaction equipment, as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and recompact.
 - b. Density Control: Each course shall be sprinkled as required and compacted to the extent necessary to provide not less than 95 percent of the optimum density. Unless otherwise shown on the plans, the Engineer will determine roadway density of completed sections in accordance with TxDOT Test Method Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

2. When the material fails to meet the density requirements, or should the material lose the required stability, density or finish before the next course is placed, or the project is accepted, it shall be reworked as specified below.
- F. Reworking a Section:
1. When a section is reworked within 72 hours after completion of compaction, the Contractor shall rework the section to provide the required compaction.
 2. When a section is reworked more than 72 hours after completion of compaction, the Contractor shall add 25 percent of the specified rate of lime.
 3. Reworking shall include loosening, road mixing as approved by the Engineer, compacting, and finishing.
 4. When a section is reworked, a new optimum density will be determined from the reworked material in accordance with TXDOT Test Method Tex-121-E, Part II and shall compact in-place to a minimum of 95 percent of this density.
 5. Do not surface patch.
- G. Finishing:
1. Site mix subsoil, backfill and compact. Blend treated subsoil mix to achieve mix formulation and required stabilization.
 2. Place mix material in continuous layers not exceeding 12 inches depth unless otherwise indicated in drawings. Maintain optimum moisture content of mix materials to attain required stabilization.
 3. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
 4. Shape to required line, grade, and cross section.
 5. Make grade changes gradual. Blend slope into level areas.
 6. Immediately after completing compaction, clip, skin, or tight-blade the surface of the lime treated material with a maintainer or subgrade trimmer to a depth of approximately 1/4-inch.
 7. Remove loosened material and dispose of it at an approved location.
 8. Roll the clipped surface immediately with a pneumatic-tire roller until a smooth surface is attained.
 9. Add small increments of water as needed during rolling.
 10. Shape and maintain the course and surface in conformity with the typical sections, lines and grades shown on the plans or as directed.
 11. At end of day, terminate completed Work by forming a straight and vertical construction joint.
 12. Replace damaged fill with new mix to full depth of original mix.
 13. Remove surplus mix materials from site.

3.04 CURING

- A. After the final layer or course of the lime treated material has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections.
- B. The completed section shall then be finished by rolling with a pneumatic tire or other suitable roller.
1. The completed section shall be moist cured or prevented from drying by addition of an asphalt material at the rate of 0.05 to 0.20 gallons per square yard.
 2. Curing shall continue for 2 to 5 days before further courses are added or traffic is permitted, unless otherwise approved by the Engineer.

- C. The lime treated material may be covered by other courses, the day following finishing, when approved by the Engineer. When the plans provide for the treated material to be covered by other courses of material, the next course shall be applied within 14 calendar days after final compaction is completed, unless otherwise approved by the Engineer.

3.05 TOLERANCES

- A. Top Surface of Fill: Plus or minus 0.1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. Compression test and analysis of hardened fill material will be performed in accordance with ASTM D 698.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: As determined by construction materials testing firm.

END OF SECTION

RIPRAP**PART 1 GENERAL****1.01 Section Includes**

- A. Riprap rock.
- B. Cement sacks.

1.02 Related Requirements

- A. Section 31 2323 - Fill.

1.03 Price and Payment Procedures

- A. Riprap: By the square yard of riprap area; summing the areas of individual layers, of riprap sacks. Includes supply and placing riprap mix in sacks, moist cured.

1.04 Quality Assurance

- A. Perform Work in accordance with Texas Department of Transportation.
- B. Maintain one copy of each document on site.

PART 2 PRODUCTS**2.01 GENERAL RIPRAP**

- A. Riprap: Provide in accordance with State of _____ Highways standards standards.
- B. Riprap: Limestone type; broken stone or irregular shaped rock; solid and nonfriable; 4 inch minimum size, 12 inch maximum size, or as indicated on drawings.
- C. Aggregate: Granular fill, see Section 31 2323.
- D. Bags: Woven jute or geotextile fabric.
- E. Binder: Portland cement.
- F. Geotextile: Non-biodegradable, woven.

2.02 BAGGED RIPRAP

- A. Mix riprap, cement, sand and aggregate dry. Limit quantity of cement to 10 percent of dry mixed materials by volume.
- B. Fill bags with dry ingredients to 70 percent capacity and close by sewing or stapling to a straight seam.

PART 3 EXECUTION**3.01 Examination**

- A. Verify survey benchmarks and intended elevations for work are as indicated on plans.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify riprap areas are uncompromised with surface or groundwater.
- D. Do not place riprap over frozen, wet or soft subgrade surfaces.

3.02 Preparation

- A. Grade riprap areas to indicated elevations, allowing for riprap thickness. Remove organic materials and compact.

3.03 Placement

- A. Place geotextile over substrate, lap edges and ends.

- B. Place riprap at culvert pipe ends, embankment slopes, or as indicated on drawings.
- C. Place bags into position. Knead, ram, or pack filled bags to fit with the contour of adjacent material and other bags previously placed.
- D. Place bags in a staggered pattern. Remove foreign matter from bag surfaces.
- E. After placement, spray with water to moisten the bagged mix. Maintain moist for 24 hours.
- F. Installed Thickness: As indicated on drawings.
- G. Place rock into position in an interlocking manner to preclude disturbance or displacement of substrate.
- H. Place rock at location and depth indicated on drawings.

3.04 Bedding or Substrate Contact Installation**3.05 Geotextile or Bedding Contact Installation****3.06 SCHEDULES**

- A. Culvert Pipe Ends: Bagged, placed one layer thick, 6 inch average thickness, concealed with topsoil fill.
- B. Sloped Grade At Retaining Wall: Individual riprap units, 6 inch thickness; placed prior to finish topsoil.

END OF SECTION

AGGREGATE BASE COURSE**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aggregate base course.
- B. Paving aggregates.

1.02 RELATED REQUIREMENTS

- A. Section 31 2200 - Grading.
- B. Section 31 2323 - Fill.
- C. Section 32 1250 - Site Pavement.
- D. Project Geotechnical Report.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Coarse Aggregate Type ____: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing, and compacting.
- B. Fine Aggregate Type ____: By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- J. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
- K. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.
- L. TxDOT TEX-113-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials.

1.05 SUBMITTALS

- A. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Limestone, coarse, crushed rock meeting the requirements of 2004 TxDOT Item 247, Type A, Grade 1 or 2.

2.02 SOURCE QUALITY CONTROL

- A. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Spread aggregate over prepared substrate to a total compacted minimum thickness of 6 inches or as indicated on the drawings.
- B. Under Bituminous Concrete Paving:
 - 1. Place coarse aggregate to a total compacted minimum thickness of 6 inches or as indicated on the drawings.
 - 2. Compact to 95 percent of maximum dry density as determined by ASTM D 1557 at a moisture content ranging from -2 to +3 percent of the optimum moisture content unless otherwise indicated on the geotechnical report.
- C. Under Portland Cement Concrete Paving:

1. Place coarse aggregate to a total compacted minimum thickness of 6 inches or as indicated on the drawings.
 2. Compact to 95 percent of maximum dry density as determined by ASTM D 1557 at a moisture content ranging from -2 to +3 percent of the optimum moisture content unless otherwise indicated on the geotechnical report.
- D. Roller compact to specified density.
- E. Level and contour surfaces to elevations and gradients indicated.
- F. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- G. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation From Design Elevation: Within 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- B. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: To be determined by the Owner's Construction Materials Testing Contractors.
- E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade, pavers, and paving.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SITE PAVEMENT**PART 1 GENERAL****1.01 DESCRIPTION**

- A. Scope
 - 1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide hot mix-hot laid bituminous paving, as shown and specified for roadways.
 - 2. The work includes the following:
 - a. Lime Stabilized Subbase
 - b. Flexible Base
 - c. Cement Stabilized Base
 - d. Asphalt Stabilized Base
 - e. Surface Treatments
 - f. Hot Mix Asphaltic Concrete
 - g. Portland Cement Concrete Pavement
 - h. Testing As Specified

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading.
- B. Section 31 23 16 - Excavation.
- C. Section 31 23 23 – Fill.
- D. Section 32 11 23 – Aggregate Base Course.

1.03 QUALITY ASSURANCE

- A. Testing Services
 - 1. General: Testing of materials and of compaction requirements for compliance with technical requirements of the Specifications shall be the duty of a testing laboratory as provided for by the specifications for this Project.
 - 2. Testing Services:
 - a. The testing laboratory shall:
 - 1) Test the Contractor's proposed materials in the laboratory and field for compliance with the Specifications.
 - 2) Perform field density tests to assure that the specified compaction of surface and base course materials has been obtained.
 - 3) Report all test results to the Engineer and the Contractor.
 - 4) Perform concrete testing in accordance with the Project specifications.
 - 3. Authority and Duties of Testing Laboratory:
 - a. Technicians representing the testing laboratory shall inspect the materials in the field and perform compaction tests, and shall report their findings to the Engineer and the Contractor. When the materials furnished or work performed by the Contractor fails to fulfill Specifications requirements, the technician will direct the attention of the Engineer and the Contractor to such failure.
 - b. The technician shall not act as foreman or perform other duties for the Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Engineer for final acceptance. Technicians are

not authorized to revoke, alter, relax, enlarge, or release any requirements of the Specifications, nor to approve or accept any portion of the Work.

4. Responsibilities and Duties of Contractor:
 - a. The use of testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the Drawings and Specifications. To facilitate testing services, the Contractor shall:
 - 1) Secure and deliver to the Testing Laboratory, representative samples of the materials he proposes to use and which are required to be tested.
 - 2) Furnish such casual labor as is necessary to obtain and handle samples at the project or at other sources of material.
 - 3) Advise the testing laboratory and Engineer sufficiently in advance of operations (24 hrs. minimum) to allow for completion of quality tests and for the assignment of personnel.
- B. Referenced Standards
 1. Comply with the applicable provisions and recommendations of the following, unless otherwise shown or specified.
 - a. Texas Department of Transportation 2004, Standard Specification for Construction and Maintenance of Highways, Streets and Bridges.
 - b. Standard Specifications for Public Works Construction, City of San Antonio, Texas.
 - c. TxDOT TEX-113E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials; 2010.

1.04 SUBMITTALS

- A. Certificates: Submit certificates of compliance with these specifications for the following materials:
 1. Lime.
 2. Flexible Base.
 3. Asphalt Stabilized Base.
 4. Cement.
 5. Curing Seal Coat.
 6. Tack Coat.
 7. Hot Mix Asphaltic Concrete.
 8. Aggregates for Surface Treatments.
 9. Reinforcing Steel.
- B. Shop Drawings
 1. Submit the following:
 - a. Detailed reinforcing steel layout.
 - b. Detailed construction and control joint layout.
- C. Laboratory Test Reports
 1. Submit copies of laboratory test reports for optimum lime content for subgrade stabilization, and mix designs for Hot Mix Asphaltic Concrete and Portland Cement Concrete.
- D. All paving and base course materials shall be tested and approved prior to delivery to the site. Samples of materials proposed for use as pavement and base course should be submitted by the Contractor to the Testing Laboratory for testing. Samples of materials shall be submitted at least 14 days in advance of its use.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. The source of materials shall be acceptable to the Engineer. Materials shall conform to the following:
1. Flexible Base
 - a. Base material shall be crushed or uncrushed as necessary to meet the requirements hereinafter specified, and shall consist of durable stone or gravel, crushed and/or screened to the required particle size, with or without other approved fine sized materials. The material shall be from approved sources.
 - 1) Testing of flexible base material shall be in accordance with the following standard laboratory test procedures:
 - (a) Preparation of Soil
 - (b) Constants and Sieve Analysis: TxDOT TEX-110-E
 - (c) Liquid Limit: TxDOT TEX-104-E
 - (d) Plastic Limit: TxDOT TEX-105-E
 - (e) Plasticity Index: TxDOT TEX-106-E
 - (f) Linear Shrinkage: TxDOT TEX-107-E
 - (g) Sieve Analysis: TxDOT TEX-110-E
 - (h) Wet Ball Mill: TxDOT TEX-116-E
 - (i) Los Angeles Abrasion: ASTM C 131 (Grad. A)
 - 2) Samples for testing the material shall be taken prior to compaction operations.
 - 3) The material shall be well graded and when properly tested shall meet the following requirements of Texas Department of Transportation Specifications for Type A Grade 2 Flexible Base:
 - (a) Retained on 2½ inch sieve: 0%
 - (b) Retained on 1¾ inch sieve: 0-10%
 - (c) Retained on No. 4 sieve: 45-75%
 - (d) Retained on 40 mesh sieve: 60-85%
 - 4) The material passing the 40 mesh sieve shall be known as "Soil Binder" and shall meet the following requirements:
 - (a) The liquid limit shall not exceed 40.
 - (b) The plasticity index shall not exceed 12.
 - (c) The linear shrinkage shall not exceed 10.(Note: The linear shrinkage shall be calculated from the volumetric shrinkage at the liquid limit.)
 - 5) The crushed stone or crushed gravel shall have an abrasion of no more than 40 when subjected to the Los Angeles Abrasion Test.
 2. Asphalt Treated Base
 - a. This item shall consist of a compacted mixture of mineral aggregate and asphaltic material mixed hot in a mixing plant. The asphalt stabilized base shall be constructed on an approved subgrade, as herein specified and in accordance with details shown on the plans. Unless otherwise specified in this Section, all asphalt stabilized base materials shall conform to TxDOT, Item 292 "Asphalt Treatment (Plant Mixed)".
 - 1) Mineral Aggregate:

- (a) Description: The material shall be crushed or uncrushed and shall be screened as necessary to meet the requirements hereinafter specified and shall consist of durable aggregate particles. Unless otherwise specified on the plans, one or more mineral aggregates may be used to produce the specified mixture.
- (b) Grades: The grading of the mineral aggregate shall conform to the limitations as shown below:

GRADE 1:

<u>Sieve</u>	<u>Percent Retained</u>
1-1/2 inches	0%
1 inch	0-10%
3/8 inch	30-55%
No. 4	45-70%
No. 40	70-85%

- (c) Tests:
- (1) Unless otherwise specified on the plans, the mineral aggregate for Grade 1 shall meet the following physical requirements:
Los Angeles Abrasion: 50 Max.*
Plasticity Index: 10 Max.
Liquid Limit: 40 Max.
Decantation: 5% Max.
Crushed Faces: 60% Max.
Sand equivalent value shall not be less than 40.
*Wet Ball Mill may be used in lieu of Los Angeles Abrasion when shown on the plans. A maximum Wet Ball Mill value of 50 is allowed.
- (2) Testing of the mineral aggregates shall be as required and in accordance with the following Texas Department of Transportation Standard Test Methods:
Preparation of Soil
Constants and Sieve Analysis: TEX-110-E
Liquid Limit: TEX-104-E
Plastic Limit: TEX-105-E
Plasticity Index: TEX-106-E
Sieve Analysis: TEX-110-E
Wet Ball Mill: TEX-116-E
Los Angeles Abrasion: TEX-410-A
Sand Equivalent: TEX-203-F
Decantation: TEX-406-A
Crushed Faces: TEX-460-A
- (3) Samples for testing the material shall be taken prior to the mixing operations. Where more than one material is used, tests will be on the combined material unless otherwise shown on the plans.
- (d) Additives:

- (1) Additives to facilitate mixing and/or improve the quality of the asphaltic mixture shall be used when noted on the plans or may be used upon written authorization by the Engineer.
- (e) Material Sources:
 - (1) All materials shall be obtained from sources reviewed by the Engineer.
 - (2) The mineral aggregate sources shall be opened up in such manner as to immediately expose the vertical faces of all the various strata of acceptable material and, unless otherwise directed by the Engineer, the material shall be secured in successive vertical cuts extending through all the exposed strata in order that a uniformly mixed material will be secured.
 - (3) Unless otherwise shown on the plans, one or more types of mineral aggregate or binder may be used to produce the specified mixture.
 - (4) Recycled Materials, including reclaimed asphalt concrete pavement (RAP), are allowed when shown on plans and are to be in accordance with Item 292 of the Texas Department of Transportation Standard Specifications. Stockpile aggregates for each source and type separately. Do not add material to an approved stockpile unless approved by the Engineer.
- 2) Asphaltic Material:
 - (a) Asphaltic material shall be of the type determined by the Engineer and shall meet the requirements of Item No. 300, "Asphalt, Oils and Emulsions" of the Texas Department of Transportation Standard Specifications. The grade of asphalt shall be PG 70-22 unless otherwise designated on the plans. When RAP is allowed by plan note, use no more than 30% RAP in TxDOT Type A or B HMA, and use no more than 20% RAP for TxDOT Type C or D unless otherwise shown on the plans.
- 3) Asphaltic Stabilized Mixture:
 - (a) Paving Mixture:
 - (1) The mixture shall consist of a uniform mixture of mineral aggregate and asphaltic material. The mineral aggregate will conform to the gradation requirements specified. The asphaltic material shall form from 4.0 to 9.0 percent of the mixture by weight unless otherwise shown on the plans. The design percent asphalt shall be determined in accordance with Test Method TEX-126-E or Test Method TEX-204F and procedures outlined in the TxDOT Bulletin C-14. The required method of control along with any required strength, laboratory density shall be specified on the plans. The percent asphalt in the mix shall be determined by either Extraction, Test Method TEX-210-F, or Pressure Pycnometer, Test Method TEX-126-E.
 - (b) Tolerances:
 - (1) The Engineer will designate the asphalt content to be used in the mixture after design tests have been made with the aggregate to be used in the project. When tested as determined by the Engineer, samples of the mixture shall not vary from the asphalt content

designated by the Engineer by more than 0.5 percent dry weight (based on total mixture).

3. Water
 - a. Water shall be free from substances deleterious to the hardening of the treated base and shall be reviewed by the Engineer.
4. Cement for Stabilized Base
 - a. Cement shall be Type 1 Portland Cement of a standard brand and shall conform to the requirements of ASTM Designation C-150.
 - 1) One bag, containing one (1) cubic foot of cement shall be considered as weighing 94 pounds net. One (1) barrel of cement shall be considered as weighing 376 pounds net, and containing four (4) cubic feet.
 - 2) Contractors, as their option, may use bulk cement, provided the apparatus for handling and spreading the cement is reviewed by the Engineer. Bulk cement shall be weighed on platform scales or standard plant batch weighing equipment reviewed by the Engineer.
 - 3) Cement delivered in bags shall be plainly marked with the brand name of the manufacturer. All bags shall be in good condition at the time of delivery. Cement salvaged from discharge or used bags shall not be permitted.
5. Asphalt Oils and Emulsions
 - a. RC-250 Liquid Asphalt and SS-1/SS-1H Emulsion used as a seal shall meet the requirements set forth in Item 300 "Asphalts, Oils and Emulsions," of the Texas Department of Transportation Standard Specifications.
 - b. Where Emulsified Asphalts are used, the amount of emulsified asphalt as a percentage by volume of the total mixture shall be within the limits shown on the plans, or shall be of a percentage as directed by the Engineer.
 - 1) Prime Coat:
 - (a) Unless the type and grade are shown on the plans, utilize an MC-30 or AE-P asphalt cement in accordance with Item 300, "Asphalts, Oils and Emulsions" of the Standard Specifications of the Texas Department of Transportation for prime coat. Emulsified asphalts as a percentage by volume of the total mixture shall be used within the limits shown on the plans or as directed/approved by the Engineer.
 - 2) Tack Coat:
 - (a) The asphaltic material used for Tack Coat shall meet the requirements for "Asphalt Cement", "Cut-Back Asphalt", or "Emulsified Asphalt", in Item No. 300 "Asphalts, Oils and Emulsions," of the Texas Department of Transportation Standard Specifications. The asphaltic material used for Tack Coat shall be that type or grade shown on the plans, or shall be as directed, or approved by the Engineer.
 - 3) Asphaltic Materials for Surface Treatments:
 - (a) The asphaltic material used for surface treatments shall meet the requirements for "Asphaltic Cement" in Item No. 300 "Asphalts, Oils and Emulsions" of the Texas Department of Transportation Standard Specifications. The asphaltic material used shall be AC-10 or equal, or shall be as approved by the Engineer.
6. Aggregates for Surface Treatments

- a. Aggregates shall meet all the requirements of Item No. 302, "Aggregates for Surface Treatments" of the Texas Department of Transportation Standard Specifications and subsequent revisions thereto.
 - b. The percent of wear, as determined by Test Method TEX-410-A for the material shall not exceed 15 percent. The aggregate shall be Grade 3, in accordance with the following gradation requirements when tested by Test Method TEX-200.
 - 1) Retained on 3/4" sieve: 0%
 - 2) Retained on 5/8" sieve: 0-2%
 - 3) Retained on 1/2" sieve: 5-20%
 - 4) Retained on 3/8" sieve: --
 - 5) Retained on No. 4 sieve: 90-100%
 - 6) Retained on No. 10 sieve: 98-100%
7. Hot Mix Asphalt Concrete
- a. Materials used in Hot Mix Asphalt Concrete Pavement shall meet the requirements as set forth in Item 340, "Dense-Graded Hot Mix Asphalt (Method)" or Item 341, "Dense-Graded Hot Mix Asphalt (QC/QA)" of the Texas Department of Transportation Standard Specifications.
 - b. Paving Mixture used shall be Type D. This mixture shall conform to the requirements of Paragraph 4 of Item 340, "Dense-Graded Hot Mix Asphalt (Method)" of the Texas Department of Transportation Standard Specifications.
 - 1) Part (1) of Paragraph 4 shall be revised as follows, and no other requirements are waived or changed hereby.
 - (a) Density
 - (1) Minimum: 94%
 - (2) Maximum: 99%
 - (3) Optimum: 97%
8. Lime for Stabilized Subgrade
- a. Lime for this item shall conform to the requirements of TxDOT Item No. 260, "Lime-Treatment - Road Mixed" of the TxDOT Standard Specifications (Latest Edition). Acceptable forms of lime shall be:
 - 1) "Type A, Hydrated Lime"
 - 2) "Type B, Commercial Lime Slurry"
 - 3) "Type C, Quicklime"
 - b. The Contractor shall select, prior to construction, the grade to be used and shall notify the Engineer in writing before changing from one grade to another. Lime shall be placed in slurry form only, unless written permission is granted by the Engineer and a safety and containment plan is submitted to the Engineer by the Contractor seven days prior to use. In circumstances where it would be beneficial to utilize lime for "drying" subgrade materials to expedite construction, the Contractor may request approval from the Engineer to use pelletized lime.
 - c. Materials are to be provided in conformance with the following items and requirements:
 - 1) Lime: TxDOT DMS-6350 "Lime and Lime Slurry"
 - 2) Mix Design: The Engineer will determine the target lime content and optimum moisture content in accordance with TxDOT TEX-121-E.
 - 3) When treating existing materials, limit the amount of asphalt concrete pavement to no more than 50% of the mix.

9. Forms
 - a. Formwork shall conform to the provisions of TxDOT Item 360 "Concrete Pavement". Forms shall be constructed of wood or steel, profiled to suit condition.
10. Concrete Pavement
 - a. Concrete and concrete materials shall conform to the provisions of the TxDOT Standard Specifications Item 360, "Concrete Pavement", unless otherwise stated in this specification.
 - 1) Coarse aggregate will conform to the gradation requirements of Aggregate Grade No. 2.
 - 2) Fine aggregates will conform to the gradation requirements of Aggregate Grade No. 1.
 - 3) Portland Cement shall be Type I.
 - b. Air content shall be $4\% \pm 1\%$.
 - c. Slump shall range from 2 to 5 inches.
 - d. Provide concrete design per Geotechnical Report. If not specified, provide Class P concrete designed to meet a minimum average compressive strength of 4,000 psi at 28-days (75% strength at 7 days). Test in accordance with TxDOT TEX-448-A or TxDOT TEX-418-A.
 - e. For concrete curbs that are placed separately from the pavement, refer to specification Section 32 1313.10 (use Class A or P concrete for curbs that are placed separately from the pavement).
11. Steel Expansion Joint Dowels
 - a. Dowel bars shall be round smooth steel conforming to ASTM A 36, Grade 60. Coat dowels with an approved de-bonding material.
12. Reinforcing Steel
 - a. Reinforcing steel bars shall conform to TxDOT Item 440, "Reinforcing Steel", ASTM A 615 Grade 60, deformed bars. All reinforcing steel shall be new billet steel.

2.02 CUTTING AND REPLACING PAVEMENTS

- A. All materials used for cutting and replacing pavements shall conform to the requirements of this section.

PART 3 EXECUTION

3.01 GENERAL

- A. The drives and parking areas shall be constructed to the lines, and typical section shown on the drawings.

3.02 SUBGRADE PREPARATION

- A. Preparation of the subgrade including compaction shall be completed for the full width of the roadways and parking areas, or as shown on plans.
 1. The subgrade shall be compacted to at least 95 percent (95%) of maximum density between optimum moisture content and optimum moisture content +4% as determined by TxDOT TEX-114-E.
- B. No materials shall be placed on subgrades which are muddy or have water thereon.

3.03 CONSTRUCTION OF HOT MIX ASPHALTIC CONCRETE ROADWAYS, AND PARKING AREAS

- A. General

1. The roadways, and parking areas shall be constructed to the lines, grades, and typical section shown on the Drawings.
 2. Conform to all applicable requirements of the Texas Department of Transportation Standard Specifications.
- B. Flexible Base Course
1. Equipment:
 - a. All equipment necessary to properly perform and complete the work shall be on the project prior to beginning the work, shall be subject to the review of the Engineer, and shall be maintained in a satisfactory condition at all times.
 - 1) Motor graders shall be self-propelled, shall have tandem or four-wheel drive, shall have a blade length of not less than 12 feet, shall have a wheel base length (the distance between front and rear axles) of not less than 16 feet, and shall be tight and in good operating condition and reviewed by the Engineer.
 - 2) Compaction equipment shall be of sufficient weight and adequately loaded to accomplish the required compaction.
 - 3) Water distributors shall be equipped with positive and rapidly working cut-off valves, approved spray bars equipped with bituminous nozzles and a power pump that will insure distribution of water in a uniform and controllable rate of application. Spray bars shall be so constructed that the effective length may be quickly and easily altered.
 - 4) All equipment shall meet these specifications and be reviewed by the Engineer. Equipment may be eliminated or substituted only upon review of the Engineer.
 - 5) Nothing in this section shall relieve the Contractor of his responsibility for producing finished work of the quality specified.
 2. Construction Methods:
 - a. General:
 - 1) It is the intent of this specification to obtain a complete course, or courses, of Flexible Base of uniform moisture and density, with a closely-knit surface free from laminations, cracks, ridges, or loose material, and to the surface requirements hereinafter specified.
 - b. Placing of Flexible Base Material:
 - 1) The Flexible Base material shall be placed on the approved subgrade in courses not to exceed six inches (6") compacted depth. It shall be the responsibility of the Contractor that the required amount of material be delivered and uniformly spread and shaped. All material shall be moved from the place where it is dumped by cutting into windrows. After the material has been cut into windrows, it shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation, and as necessary for required compaction.
 - c. Compaction and Finishing:
 - 1) Flexible Base shall be compacted to an apparent dry density of not less than 95 percent of the maximum dry density, as determined in accordance with TxDOT Test Method TEX-113-E. Tests for density will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the density required. Just prior to the placing of any succeeding course of Flexible Base, surfacing on any previously completed course, the density and moisture of the top three inches

(3") of Flexible Base shall be checked and if tests show the density to be more than 2 percent below the specified minimum, or the moisture content to be more than 3 percent above or below the optimum, the course shall be reworked as necessary to obtain the specified compaction and moisture content.

- 2) The surface upon completion shall be smooth and in conformity with the typical sections and to the established lines and grades. Any deviation in excess of 1/4 inch in cross-section and in length of 16 feet measured longitudinally, shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

C. Asphalt Stabilized Base Course

1. Equipment:

- a. All equipment for the handling of all materials and mixing and placing of the mixture shall be maintained in good repair and operating condition and subject to review by the Engineer. Any equipment found to be defective and affecting the quality of the mixture will be replaced.
- b. Mixing Plants:
 - 1) Mixing plants that will not consistently produce a paving mixture meeting all the requirements of this specification will be condemned. Mixing plants may be of the weight-batching type, the continuous mixing type or the dryer-drum type meeting all the requirements of Item 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas Department of Transportation Standard Specifications and subsequent revisions and Special Provisions thereto.
- c. Asphalt Material Heating Equipment:
 - 1) Asphalt material heating equipment shall conform to Paragraph 345.4 of Item 345, "Asphalt Stabilized Base (Plant Mix)" of the Texas Department of Transportation Standard Specifications and subsequent revisions and Special Provisions thereto.
- d. Spreading and Finishing Machine:
 - 1) The spreading and finishing machine shall be of a type reviewed by the Engineer and shall be capable of producing a surface that will be smooth and true to the established line, grade and cross-section and acceptable to the Engineer. Unacceptable finish shall be corrected by the addition of mixture placed and finished at the entire expense of the Contractor.

2. Construction Methods:

- a. It shall be the responsibility of the Contractor to produce transport, place and compact the specified mixture in accordance with these specifications and as reviewed by the Engineer.
- b. The asphaltic mixture, when placed with a spreading and finishing machine shall not be placed when the air temperature is below 50°F, and is falling, but it may be placed when the air temperature is above 40°F and is rising. The mixture when placed with a motor grader shall not be placed when the air temperature is below 60°F, and is falling, but may be placed when the air temperature is above 50°F and is rising. The air temperature shall be taken in the shade away from artificial heat. It is further provided that the prime coat, tack coat or asphalt stabilized base shall be placed only when the humidity, general weather conditions and temperature and

moisture conditions of the subbase or subgrade, in the opinion of the Engineer are suitable.

- c. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50°F or more below the temperature reviewed by the Engineer all or any part of the load may be rejected and payment will not be made for the rejected material.

1) Prime Coat:

- (a) If a prime coat is required it shall be applied and paid for as a separate item conforming to the requirements of Texas Department of Transportation Item 300 "Prime Coat", except the air temperature for application shall be as provided above for asphaltic mixture to be laid by a spreading and finishing machine. The tack coat or asphalt stabilized base shall not be applied on a previously primed course until the prime coat has completely cured to the satisfaction of the Engineer.

2) Tack Coat:

- (a) Before the asphaltic mixture is laid, the surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer. The surface shall be given a uniform application of tack coat using asphaltic materials of this specification. This tack coat shall be applied, as directed by the Engineer, with an approved sprayer at a rate not to exceed 0.10 gallon per square yard of surface. Where the mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Engineer. All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform coat of the asphaltic material meeting the requirements for a tack coat. The tack coat shall be rolled with a pneumatic tire roller when directed by the Engineer.

3) Transporting:

- (a) The asphaltic mixture, prepared as specified above shall be hauled to the site in tight vehicles previously cleaned of all foreign material. The dispatching of the vehicles shall be arranged so that all material delivered may be placed, and all rolling shall be completed during daylight hours. The inside of the truck body may be given a light coat of oil, lime slurry or other material satisfactory to the Engineer, if necessary, to prevent mixture from adhering to the body. In cool weather or for long hauls, canvas covers and insulating of truck bodies may be required.

4) Placing:

- (a) Generally, the asphaltic mixture shall be dumped and spread on the approved prepared surface with the specified spreading and finishing machine, in such a manner that when properly compacted, the finished course will be smooth, of uniform density, and will conform with the typical sections shown on the plans and to the lines and grades established by the Engineer. During the application of asphaltic material, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures. Any unsightly splattering of surroundings shall be clean and restored to original condition at the sole cost of the Contractor.

- (b) The mixture shall be spread and compacted in layers or lifts as specified on the plans or as directed by the Engineer. The sequence of compacting shall be such that undue displacement of the edge of the course does not occur. On deep lifts, the edge of the course may be rolled with a motor grader wheel or similar equipment or supported by blading a roll of earth against the edge of the course prior to compacting the surface.
 - (c) When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement or placed in small irregular areas when the use of a finishing machine is not practical, the finishing machine may be eliminated when authorized by the Engineer, provided a satisfactory surface can be obtained by other acceptable methods.
- 5) Compacting:
 - (a) As directed by the Engineer the asphalt stabilized base shall be compacted thoroughly and uniformly with the specified rollers. In lieu of the rolling equipment specified, the Contractor may, upon written authorization from the Engineer, operate other compacting equipment that will provide equivalent relative compaction as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction as would be expected of the specified equipment, as determined by the Engineer, its use shall be discontinued. When directed by the Engineer, the initial compaction shall be accomplished with the pneumatic tire roller.
 - (b) When rolling with the three-wheel, tandem, or vibratory rollers, rolling shall start longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the rear wheel unless otherwise directed by the Engineer. Alternate trips of the roller shall be slightly different in length. When roller with vibratory steel-wheel rollers, the manufacturer's recommendation shall be followed unless directed otherwise by the Engineer. Rolling with pneumatic-tire roller shall be done as directed by the Engineer. Roller shall be continued until no further increase in density can be obtained and all roller marks are eliminated. The motion of the roller shall be slow enough at all times to avoid displacement of the mixture. If any displacement occurs, it shall be corrected at once by the use of a rake, and of fresh mixtures where required. The roller shall not be allowed to stand on any portion of the mixture pavement which has not been fully compacted. To prevent adhesion of the mixture to the roller, the wheels shall be kept thoroughly moistened with water, but an excess of water will not be permitted. All rollers must be in good mechanical condition. Necessary precautions shall be taken to prevent the dropping of gasoline, oil, grease or other foreign matter on the roadway, either when the rollers are in operation or when standing.
 - (c) Hand Tamping:
 - (1) The edges of the pavement along curbs, headers and similar structures, and all places not accessible to the roller, or in such

positions as will not allow thorough compaction with the rollers, shall be thoroughly compacted with lightly oiled tamps.

(d) Surface Finish:

- (1) The compacted material shall conform to the typical cross sections, lines and grades as shown on plans and directed by the Engineer and shall have a surface smoothness as specified below and with a reasonably uniform texture acceptable to the Engineer. Unacceptable finished surfaces may be corrected by the placement of additional mixture, all at the expense of the Contractor.

(e) Surface Smoothness:

- (1) Test finished surface of each bituminous concrete course for smoothness, using a 10-foot straightedge applied parallel to and at right angles to centerline of paved areas.
- (2) Check surfaced areas at intervals as directed by Engineer.
- (3) Surfaces will not be acceptable if exceeding the following:
Sub-base Courses: 3/8 inch in 10 feet
Surface Course: 1/4 inch in 10 feet
Crowned Surfaces:
Test crowned surfaces with a crown template, centered and at right angle to the crown.
Surfaces will not be acceptable if varying more than 1/4" from the template.
Protection of the Work and Opening to Traffic:
- (4) The completed asphalt stabilized base course shall be opened to traffic as provided by the plans and as directed by the Engineer. All construction traffic allowed on the base course shall comply with the State laws governing traffic, unless otherwise authorized by the Engineer. When another roadway surface is provided for the traveling public and construction traffic through the project, the Engineer may prohibit traffic on the completed base course.

3. In Place Density:

- a. When in-place density is required, it is the intent of this specification that the material be placed and compacted to 96 percent of the maximum molded gyrated density as determined by Test Method TEX-126-E or as specified on the plans. The maximum molded gyrated density shall be determined from material sampled from the mixing plant and molded in accordance with Test Method TEX-126-E. Procedures and methods outlined in Test Method TEX-126-E shall also be used in determining the in-place density unless determined otherwise by the Engineer. The field specimens utilized for the in-place density testing may be either cores or sections of asphalt stabilized base tested according to Test Method TEX-207-F. Other methods of determining in-place density which correlate satisfactorily with those results obtained through use of Test Method TEX-126-E may be used. In-place density tests are intended for control tests. If the in-place density of the mixture produced has a value lower than that specified and, in the opinion of the Engineer is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction operations until the in-place density equals or exceeds the specified density. Requirements

specifying air temperature limitations for placing and types of rollers to be furnished are not applicable when in-place density is specified. Regardless of the method of compaction control followed, all rolling shall be completed before the mixture temperature drops below 175°F.

D. Cement Stabilized Base Course

1. Equipment:

- a. All equipment necessary to properly perform and complete the work shall be on the project prior to beginning the work, shall be subject to the review of the Engineer, and shall be maintained in a satisfactory condition at all times.
- b. The following list of equipment shall be considered the minimum necessary for cement stabilized base work:
 - 1) A single pass traveling mixing plant may be used if it can be made to meet the exact requirements of this Specification.
 - 2) In lieu of a traveling mixing plant, the following equipment shall be used for the "Mixed-in-Place" method of processing:
 - (a) 1-Motor Grader
 - (b) 1-7-foot self-powered, self-propelled, heavy-duty rotary speed mixer.
- c. Motor graders shall be self-propelled, shall have tandem or four-wheel drive, shall have a blade length of not less than 12 feet, shall have a wheel base length (the distance between front and rear axles) of not less than 16 feet, and shall be tight and in good operation condition and reviewed by the Engineer.
- d. Cement shall be distributed by cement spreaders equipped with hoppers of adequate capacity to prevent spillage. The proportioning and distributing devices shall be positive in action and capable of necessary adjustments in quantity of cement spread and width of lane spread. The spreader shall be so designed that its accuracy is not varied by changing conditions of the surface over which it operates. The cement spreader shall distribute cement to an accuracy of five percent (5%) of theoretical quantity per square yard and shall be approved by the Engineer.
- e. Compaction equipment shall be of sufficient weight and adequately loaded to accomplish the required compaction.
- f. Water distributors shall be equipped with positive and rapidly working cut off valves, approved spray bars equipped with bituminous nozzles and a power pump that will insure distribution of water in a uniform and controllable rate of application. Spray bars shall be so constructed that the effective length may be quickly and easily altered.
- g. All equipment shall meet these specifications and be reviewed by the Engineer. Equipment may be eliminated or substituted only upon review by the Engineer.
- h. Nothing in this section shall relieve the Contractor of his responsibility for producing finished work of the quality specified.

2. Test Section:

- a. If the Contractor has had no previous experience in construction of "Cement Stabilized Base", he shall be required to construct a "Test Section" in accordance with the following:
- b. The first section of each cement treated course shall serve as a test section. Its length (not less than 350 linear feet or more than 500 linear feet) shall be determined by the capability of the equipment to perform the work. In case it is found that the work is not satisfactory with respect to the specification

requirements, the Contractor shall revise his procedures and augment or replace equipment as necessary to assure work completed in accordance with the Specifications. Additional test sections may be required as directed by the Engineer. Test sections not conforming to the requirements of the Specifications shall be reconstructed.

3. Construction Methods:

a. General:

- 1) It is the intent of this specification to obtain a complete course or courses of cement stabilized base of uniform moisture and density, containing a uniform mixture of cement; a closely knit surface free from laminations, cracks, ridges, or loose material and to the surface requirements hereinafter specified. It shall be the responsibility of the Contractor to furnish adequate equipment and regulate his sequence of operation in such a manner as to provide a cement treated course or courses with the proper amount of cement for the depth as shown on the plans and to maintain or reconstruct the course or courses as necessary to conform to the specific requirements specified.

b. Placing of Base Material:

- 1) After approval of the subgrade, base material shall be delivered on the road and placed in windrows of uniform sections, then accurately bladed and shaped to required crown and grade to provide a base of compacted depth required by the plans.

c. Final Preparation of Section:

- 1) On the day immediately preceding processing, water, as required, shall be added and uniformly mixed full depth with the base material. This operation shall precede cement spreading by at least 12 hours. The section shall then be accurately bladed and shaped to required grade and section.

d. Application of Cement:

- 1) The specified quantity of Portland Cement required for the full depth of treatment shall be uniformly spread over the surface. Each pass of the cement spreader shall be positioned by either the curb line or a string line. Cement shall be applied only to such areas as can be completed as herein specified within the daylight hours of the same day. No equipment, except that used in spreading and mixing, will be allowed to pass over the freshly spread cement until it is mixed with the base material.

e. Mixing and Processing:

- 1) Either method (1) or (2) below may be used at the option of the Contractor. Method (3) shall be used only on sections less than 200 linear feet in length.

(a) Multiple-Pass Traveling Mixing Plant:

- (1) After the cement has been applied, it shall be mixed with the base or subbase material. Mixing shall continue until the cement has been sufficiently blended with the base or subbase material to prevent the formation of cement balls when water is applied. Any mixture that has not been compacted and finished shall not remain undisturbed for more than 30 minutes.
- (2) Immediately after the mixing of base or subbase material and cement is completed, water, as necessary, shall be uniformly applied and incorporated into mixture. Proper care shall be exercised to insure

proper moisture distribution at all times. After the last increment of water has been added, mixing shall continue until a thorough and uniform mix has been obtained.

(b) Single-Pass Traveling Mixing Plant:

- (1) After the cement has been applied, it shall be sufficiently mixed with the base or subbase material to prevent the formation of cement balls when water is applied. Unpulverized soil lumps in mixture will not be allowed. Should this condition prevail, the Contractor shall "pre-wet" the raw base or subbase material as necessary to correct this condition. The mixer shall be provided with means for visibly and accurately gauging the water application. The water shall be applied uniformly through a pressure spray bar. After cement is spread, mixing operations shall proceed as follows:
- (2) The mixer shall, in one continuous operation, mix the base or subbase material and cement full depth, add the required moisture uniformly, thoroughly moist-mix the material, cement, and water, spread the completed mixture evenly over the machine processed width of the subgrade, and leave it in a loose condition ready for immediate compaction.
- (3) The mixture shall not remain undisturbed, after mixing and before compacting, for more than 30 minutes.

(c) Blade Mixing:

- (1) On sections of street of 200 linear feet or less and authorization by the Engineer, the requirements for mixing equipment may be waived and the cement mixed with a mortar grader.
- (2) Immediately after the cement has been distributed, the material shall be scarified full depth and the cement mixed with the loose base material for the full depth of the treatment by blading into windrows. Mixing shall continue until the cement has been sufficiently blended with the base material to prevent formation of cement balls when water is applied.
- (3) Immediately after the mixing of base material and cement is complete, water as necessary shall be uniformly applied and incorporated into the mixture. Pressurized equipment and supply provided shall be adequate to insure continuous application of the required amount of water to the section being processed. Proper care shall be exercised to insure proper moisture distribution at all times. After the last increment of water has been added, mixing shall continue until thorough and uniform mix has been obtained.

f. Compaction and Finishing:

- 1) The material shall be compacted to not less than 95 percent of the maximum dry density as determined by TxDOT TEX-113-E. At the start of compaction, the percentage of moisture in the mixture shall be less than that quantity which will cause the mixture to become unstable during compaction and finishing.
- 2) The surface upon completion shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of ¼

inch in cross section and in a length of 16 feet measured longitudinally shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

- 3) All sections of cement stabilized base shall be processed full width each day without longitudinal construction joints.
 - 4) The density of the cement stabilized base shall be determined by the Engineer after construction. Any portion which has a density below that specified herein and which has not properly hardened after a suitable time interval shall be removed and replaced to meet this Specification at the expense of the Contractor.
- g. Protection and Cover:
- 1) The completed cement treated base course shall be protected against rapid drying by applying a minimum of 0.20 gallons per square yard of RC-2 Liquid Asphalt, or a minimum of 0.15 gallons per square yard of EA-11M Emulsion. The actual amounts may be varied in the field by the Engineer to insure that a complete and adequate seal is achieved.
 - 2) This curing seal shall be applied as soon as practicable, but not later than eight (8) hours after the completion of final compaction. The surface shall be kept moist until the curing seal is applied. It shall be the responsibility of the Contractor to protect the asphalt membrane from being picked up by traffic by either sanding or dusting the surface.
 - 3) The curing period shall be a minimum of 14 days (24 hours each) with a minimum temperature of 40°F unless waived by the Engineer.
- h. Weather Limitations:
- 1) Cement stabilized base construction shall not begin unless the temperature is at least 40°F in the shade and rising or when the wind velocity exceeds 15 MPH. The Contractor is responsible for the quality of the base under any weather conditions.
- i. Traffic:
- 1) The Contractor shall not be permitted to drive heavy equipment over completed portions, but pneumatic-tired equipment required for hauling cement and water may be permitted after the surface has hardened sufficiently to prevent the equipment from marring the surface, provided protection and cover specified herein are not impaired. The cement stabilized base may be opened to local traffic as soon as the RC-2 has been applied and dusted or sanded as necessary to prevent it from being picked up by traffic. It may be opened to all traffic after 7 days.
- j. Maintenance:
- 1) The Contractor shall be required to maintain at his own expense the entire cement stabilized base within the limits of his contract in good condition satisfactory to the Engineer from the time he first starts work until all work shall have been completed.
 - 2) Maintenance shall include immediate repairs of any defect that may occur after construction, which work shall be done by the Contractor at his own expense and repeated as often as necessary to keep the area continuously intact. Repairs are to be made in a manner to insure restoration of a uniform surface of good quality cement stabilized base. Faulty work shall be replaced

for the full depth of base. Any low area shall be remedied by replacing the material for the full depth of treatment, rather than adding a thin layer of base material to the completed work.

E. Prime Coat

1. When the area and/or base is satisfactory to receive the prime coat, the surface shall be cleaned by sweeping or other acceptable methods. If necessary, the surface shall be lightly sprinkled with water just prior to application of the asphaltic material. The asphaltic material shall be applied on the clean surface by an acceptable type of self-propelled pressure distributor so operated as to distribute the prime coat at a rate not to exceed 0.20 gallon per square yard of surface, evenly and smoothly, under a pressure necessary for proper distribution. During the application of prime coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures.
2. Prime Coat shall not be applied when the air temperature is below 60° F and falling, but it may be applied when the air temperature is above 50° F and is rising; the air temperature being taken in the shade away from artificial heat.
3. Asphaltic material shall not be placed when general weather conditions, in the opinion of the Engineer, are not suitable.

F. Tack Coat

1. Before the tack coat is applied, the surface shall be cleaned thoroughly. The asphaltic material shall be applied on the clean surface by an acceptable type of self-propelled pressure distributor so operated as to distribute the tack coat at a rate not to exceed 0.10 gallon per square yard of surface, evenly and smoothly under a pressure necessary for proper distribution. Where the pavement mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Engineer. All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform coat of the asphaltic material used for tack coat. The tack coat shall be rolled with a pneumatic tire roller. During the application of tack coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures.

G. Hot Mix Asphaltic Concrete

1. Construction methods used in laying Hot Mix Asphaltic Concrete Pavement shall meet the requirements as set forth in Item 340 "Hot Mix Asphaltic Concrete Pavement" of the Texas Department of Transportation Standard Specifications, with the following exception:
2. Application of Hot Mix Asphaltic Concrete Pavement shall not begin unless the air temperature is at least sixty degrees Fahrenheit (60° F) and rising.

H. Surface Treatments

1. The area to be treated shall be cleaned of dirt, dust, or other deleterious matter by sweeping or other approved methods. If it is found necessary by the Engineer the surface shall be lightly sprinkled just prior to the first application of asphaltic material.
2. Asphaltic material shall be applied on the clean surface by an acceptable type of self-propelled distributor so operated as to distribute the material at the rate as shown on the plans, evenly and smoothly, under pressure necessary for proper distribution. The Contractor shall provide all necessary facilities for determining the temperature of the asphaltic material in all of the heating equipment and in the distributor, for

determining the rate of which it is applied, and for securing uniformity at the junction of two distributor loads. The distributor shall have been recently calibrated. Asphaltic materials shall not be applied until immediate covering is assured.

3. Aggregate shall be immediately and uniformly applied and spread by an acceptable self-propelled continuous feed aggregate spreader, unless otherwise authorized by the Engineer. The aggregate shall be applied at a rate as directed by the Engineer.
 4. The entire surface shall then be broomed or raked as required and shall be thoroughly rolled as soon as practicable after its application. The cover material shall be rolled for its entire width with a multiple wheel self-propelled pneumatic tired traffic roller with provisions for loading to 8 tons. Rolling shall begin longitudinally at the edges of the mat and progress toward the center, uniformly lapping each preceding track by at least 1/2 the width of the roller and be repeated as often as necessary to thoroughly key the cover material into the bitumen over the entire surface. The roller shall be in first class operating condition.
 5. Surface treatment or treatments shall not be applied when the air temperature is below 60°F and is falling, but is may be applied when the air temperature is above 50°F and is rising. Air temperature shall be taken in the shade and away from artificial heat. Asphaltic material shall not be placed when general weather conditions, in the opinion of the Engineer, are not suitable.
 6. The Contractor shall be responsible for the maintenance of the surface until the work is acceptable to the Engineer.
- I. Construction Joints
1. Construction joints shall be made in such a manner as to ensure a neat junction, thorough compaction, and bond throughout.
 2. A transverse joint extending over the full width of the strip being laid and at right angles to its centerline shall be constructed at the end of each day's work and at any other times when the operations of placing the hot mixture are suspended for a period of time which will permit the mixture to chill. The forward end of a freshly laid strip shall be thoroughly compacted by rolling before the mixture has become chilled. When work is resumed, the end shall be cut vertically for the full depth of the layer.
 3. When new pavement is to join pavement installed by others or previously laid pavement by the Contractor, the in-place pavement shall be neatly and carefully edged to allow for overlapping and feathering of the new surface course material. A tack coat of bituminous prime coat material shall be placed at the interface of new and previously laid material.
- J. Traffic Maintenance
1. The pavement shall be opened to traffic when directed by the Engineer. Construction traffic on the pavement shall be held to a minimum and shall be acceptable to the Engineer. Adequate protection methods as reviewed by the Engineer shall be utilized when crossing roadways is required.
- K. Field Quality Control
1. Contractor will employ a testing laboratory to perform field quality control. The testing laboratory will make compaction testing of flexible base. The testing laboratory will test the HMAC for Asphalt Extraction, Gradation, Bitumen Content, Stability and laboratory density. Contractor shall furnish all necessary assistance required by the testing laboratory. Contractor shall also furnish all labor, materials and equipment necessary

for sampling. Contractor shall furnish all necessary transportation to the Owner's Testing Laboratory required by the testing.

2. Quality Control Testing During Construction:
 - a. The testing laboratory will perform sampling and testing for field quality control during the placement of materials as follows:
 - 1) HMAC shall be tested as described in these Specifications, at least once for every 500 tons of materials placed or fraction thereof.
 - 2) Density:
 - (a) Compare density of in-place material against laboratory specimen or certificated on same for bituminous concrete mixture.
 - (b) Acceptable densities of in-place materials shall conform to applicable State Standard Requirements.
 - 3) Thickness:
 - (a) In-place compacted thickness shall average not less than the thickness specified.
 - 4) Surface Smoothness:
 - (a) Test finished surface of each bituminous concrete course for smoothness, using a 10-foot straight edge applied parallel to and at right angles to centerline of paved areas.
 - (b) Check surfaced areas at intervals as directed by Engineer.
 - (c) Surfaces will not be acceptable if exceeding the following:
 - (1) Base Courses: 3/8 inch in 10 feet.
 - (2) Surface Course: 1/4 inch in 10 feet.
 - (3) Crowned Surfaces:
Test crowned surfaces with a crown template, centered and at right angle to the crown.
Surfaces will not be acceptable if varying more than 1/4" from the template.

3.04 PORTLAND CEMENT CONCRETE PAVING

- A. General
 1. Unless otherwise noted in these Specifications, construction methods used to place all Portland Cement Concrete Paving are specified by TxDOT Standard Specifications Item 360, "Concrete Pavement".
- B. Inspection
 1. Verify subgrade is ready to support paving and imposed loads.
 2. Verify gradients and elevations of subgrade are correct.
- C. Preparation
 1. Moisten subgrade to minimize absorption of water from fresh concrete.
 2. Notify Engineer minimum 24 hours prior to commencement of concreting operations.
- D. Forming
 1. Place and secure forms to correct location, dimension, and profile.
 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
 3. Place joint fillers vertical in position, in straight lines. Secure to form work during concrete placement.

- E. Reinforcement
 - 1. Reinforcing steel shall be grade 60 and shall be placed as shown on the plans. All concrete shall be continuously reinforced as shown on the plans.
- F. Formed Joints
 - 1. Transverse and longitudinal joints shall be constructed in accordance with the details on the plans and Texas Department of Transportation Specifications.
 - 2. Joints shall be filled in accordance with the construction drawings.
- G. Placing Concrete
 - 1. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
 - 2. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Finishing
 - 1. All concrete pavement shall be finished in accordance with Texas Department of Transportation Item 360.
- I. Curing
 - 1. The Contractor shall select one of the methods of curing stated in TxDOT Standard Specifications, Item 360, Paragraph 360.11, "Curing".
 - 2. If the Contractor elects to use Membrane Curing, the curing compound must be reviewed by the Engineer.
- J. Field Quality Control
 - 1. Field inspection and testing will be performed according to the requirements of Division 1 - "General Requirements" of this project manual.
 - 2. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- K. Protection
 - 1. Immediately after placement, protect concrete under provisions of Section 03 3000 from premature drying excessive hot or cold temperatures, and mechanical injury.

3.05 PAVEMENT REPLACEMENT

- A. Cutting of Pavements
 - 1. Concrete and Asphaltic Concrete Pavements:
 - a. All concrete and asphaltic concrete pavements shall be cut with a concrete saw. The depth of the cut shall be such that upon removal of concrete and/or asphaltic concrete the sides of the cut will be straight and square. Care shall be taken, when cutting concrete pavement, not to cut transverse reinforcing steel.
- B. Removal of Bases
 - 1. Concrete and Cement Stabilized Bases:
 - a. Concrete and cement stabilized bases shall be removed by means of hand-held pneumatic pavement breakers with acceptable cutting bits. It is the intent of this specification that the base shall be removed in a manner that will leave the sides of the cut straight and square.
 - b. Where reinforcement is encountered in concrete bases, a minimum of one (1) foot shall be cleaned of all old concrete and left in place to tie to new reinforcement in the new concrete base.

2. Flexible Base:
 - a. Flexible bases shall be removed by normal trenching operations.
- C. Replacement of Bases
 1. Concrete Bases:
 - a. Concrete bases shall be replaced with Class "A" concrete conforming to the provisions of Item No. 300 "Concrete" of the City of San Antonio Standard Specifications for Public Works Construction. If existing concrete is steel reinforced, the reinforcing steel shall be replaced in accordance with Item No. 301, "Reinforcing Steel". The concrete shall have a slump of not more than three inches (3") and shall be spaded, tamped and finished to the satisfaction of the Engineer. Immediately following finishing operations, the surface shall be cured in accordance with the provisions of Item No. 305, "Membrane Curing". The concrete shall be protected from traffic for seventy-two (72) hours.
 2. Cement Stabilized Bases:
 - a. Cement stabilized base shall be replaced with cement stabilized base in accordance with Item No. 201, "Cement Stabilized Base" of the City of San Antonio Standard Specifications for Public Work Construction where width of trench permits, or with Class "C" concrete conforming to the requirements of Item No. 300, "Concrete". The concrete shall have a slump of not more than three inches (3") and shall be spaded, tamped, and finished to the satisfaction of the Engineer. The concrete shall be protected from traffic for seventy-two (72) hours prior to replacement of the surfacing.
 3. Flexible Base:
 - a. Flexible base shall be replaced with 1,000 psi (@ 28 days) concrete. The concrete shall have a slump of no more than three (3) inches and shall be spaded, tamped and finished to the satisfaction of the Inspector. The concrete shall be protected from traffic for seventy-two (72) hours prior to replacement of the surface.
 4. Asphalt Treated Base:
 - a. Asphalt treated base shall be furnished, placed and compacted in accordance with this Section.
- D. Replacement of Pavements
 1. Pavements shall be replaced under this item with either hot mix asphaltic concrete pavement, or Portland Cement concrete pavement in the thickness and type shown on the plans.
 2. When hot mix asphaltic concrete is shown on the plans as replacement of pavement, it shall be furnished and placed in accordance with TxDOT Item 340, "Hot Mix Asphaltic Concrete Pavement". Flexible bases shall be primed with asphalt or emulsion in accordance with the provision of TxDOT Item 310, "Prime Coat" prior to the placement of hot mix asphaltic concrete. All concrete bases shall receive a tack coat of asphalt or emulsion in accordance with the provisions of TxDOT Item 300, "Tack Coat" prior to replacement of hot mix asphaltic concrete.
 3. When the replacement pavement is Portland Cement concrete as indicated on the plans, "Class A" Concrete shall be furnished and placed in accordance with TxDOT Item 360, "Concrete Pavement". The concrete shall be placed, spaded, tamped and finished to the line, grade and texture of the surrounding concrete pavement.
 4. Prime Coat and Tack Coat:

- a. Prime and Tack coats shall be applied in accordance with the Texas Department of Transportation Standard Specifications Item 340.
- 5. Surface Course Applications:
 - a. The construction of all surface course shall conform to the applicable requirements of Item 340 of the TxDOT Standard Specifications.

3.06 CLEANING AND PROTECTION

- A. Cleaning
 - 1. After completion of paving operations, clean surfaces of excess or spilled bituminous materials and all foreign matter.
- B. Protect newly finished pavement until it has become properly hardened by cooling.

END OF SECTION

CONCRETE CURBS, GUTTERS AND SIDEWALKS**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Concrete sidewalks, stair steps, curbs and gutters.

1.02 RELATED SECTIONS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 31 2323 - Fill.
- C. Section 32 1123 - Aggregate Base Courses.
- D. Section 32 1250 - Site Pavement.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Sidewalks: By the square foot. Includes preparation of substrate, sand bedding, steel reinforcement, concrete sidewalk, jointing, and finishing.
- B. Concrete Curbs and Gutters: By the linear foot. Includes trenching, steel reinforcement, concrete curb installation, and cleaning.
- C. Stair Steps: By the unit price. Includes preparation of substrate, sand bedding, steel reinforcement, stair steps, jointing, and finishing.

1.04 REFERENCES

- A. ASTM D 1190, Concrete Joint Sealer Hot Poured Elastic Type.
- B. ASTM D 994-71 (R1977), Preformed Expansion Joint Filler For Concrete (Bituminous Type).
- C. ASTM D 1751-73 (R1978) Preformed Expansion Joint Fillers for concrete Paving Structural Construction.

1.05 SUBMITTALS

- A. Samples: Submit for review samples, applicable manufacturer's product data, test reports and material certifications.
- B. Shop Drawings:
 - 1. Detailed Reinforcing Steel Layout.
 - 2. Detailed Construction And Control Joint Layout.

1.06 QUALITY ASSURANCE

- A. The testing laboratory shall sample and test concrete in accordance with Section 03 3000 - Cast-In-Place Concrete.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Unless otherwise specified in this Section, all concrete and concrete materials shall conform to TxDOT, Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks".
- B. Bituminous Joint Filler: Bituminous type conforming to ASTM D 994 or D 1751 unless otherwise indicated on drawings.
 - 1. Reinforcing steel shall be ASTM A 615 grade 60, deformed and conform to the provisions of TxDOT Standard Specifications, Item No. 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks".

2. All reinforcing steel to be new billet steel.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

- A. Preparation of the subgrade including compaction shall be completed two feet (2') beyond the limits of the work:
 1. Where the subgrade is constructed by excavation of existing grade, the top six inches (6") of the subgrade shall be compacted to at least 95 percent of maximum density as determined by TxDOT TEX-113-E at a moisture content between optimum and optimum +4 percent unless otherwise indicated.
 2. The subgrade shall be brought to the final lines and grades utilizing select backfill.
 3. Pit Run Sand or Granular Embedment:
 - a. Pit run sand or granular embedment shall be provided as shown on drawings.
 - b. The material shall be as specified in Section 31 2323 and compacted as specified.

3.02 FORM CONSTRUCTION

- A. Forms shall be in conformance with TxDOT Standard Specification, Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks".
- B. Set forms to line and grade. Install forms over full length of curbs, gutters and sidewalks.

3.03 REINFORCEMENT

- A. Locate, place, and support reinforcement as specified in TxDOT Standard Specifications, Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks", unless otherwise shown on drawings.

3.04 CONCRETE PLACEMENT

- A. General: Comply with the requirements of TxDOT Standard Specifications, Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks".
- B. Machine Formed/Hand Formed:
 1. Automatic curb, gutter and sidewalk machine may be used in lieu of hand formed methods for forming and placing.
 2. Concrete shall have properties as previously specified, except that maximum slump shall be 2-1/2 inches (2 1/2") and air content shall be two percent (2%).
 3. Machine forming shall produce curbs, gutters and sidewalks to the required cross-section, lines, and grades, finish and jointing, as specified for conventionally formed concrete.
 4. Unacceptable work will be removed and replaced at Contractor's expense.

3.05 JOINTS

- A. General:
 1. Construct expansion, contraction, and construction joints with faces perpendicular to surface of the curb, gutter and sidewalk.
 2. Construct transverse joints at right angles to the work centerline and as shown.
- B. Control Joints:
 1. Provide these joints at ten feet (10') on centers for curbs and gutters and five feet (5') on centers for sidewalks.
- C. Construction Joints

1. Place joints at locations where placement operations are stopped for a period of more than 1/2 hour, except where such pours terminate at expansion joints.
- D. Expansion Joints
 1. Provide 1/2 inch expansion joint filler where work abuts structures; at returns; and at 50-foot spacing for straight runs.
 2. Where gutter and sidewalk are not poured monolithically, provide expansion joints where each abuts the other.
 3. Place top of expansion joint filler not less than 1/2 inch or more than one inch (1") below concrete surface.
 4. Apply joint sealer on top of expansion joint material flush with concrete surface, and in accordance with manufacturer's instructions.

3.06 CONCRETE FINISHING

- A. Smooth the exposed surface by screeding and floating.
- B. Work edges of gutter and sidewalks, back top edge of curb, and transverse joints; and round to 1/4-inch radius.
- C. Complete surface finishing by drawing a fine-hair broom across surface, perpendicular to line of traffic unless alternative finish is indicated on drawings.

3.07 CURING

- A. Protect and cure finished concrete curbs, gutters and sidewalks, complying with applicable requirements of TxDOT Standard Specifications, Item 529, "Concrete Curb, Gutter and Combined Curb and Gutter" and Item 531 "Sidewalks".

3.08 REPAIR AND CLEANING

- A. Broken or defective curb, gutters and sidewalks shall be repaired or replaced as directed by the Engineer at the Contractor's expense.
- B. Sweep work and wash free of stains, discolorations, dirt or other foreign material.

END OF SECTION

ASPHALT UNIT PAVING**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Asphaltic block pavers.
- B. Adhesive.

1.02 RELATED REQUIREMENTS

- A. Section 32 1123 - Aggregate Base Courses.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Asphalt Block Pavers: By the square foot. Includes preparation of substrate, priming, placing pavers, finishing.

1.04 SUBMITTALS

- A. Product Data: Provide characteristics of paver unit, dimensions, special shapes, and adhesive.
- B. Samples: Submit one sample of each paver size, illustrating style, size, color range, and surface texture of units being provided.
- C. Manufacturer's Installation Instructions: Indicate substrate requirements, installation methods.
- D. Maintenance Data: Provide data for Owner continuing maintenance of the paver surface, replacement of paver units, and surface wax maintenance requirements.
- E. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
 - 1. Extra Pavers: 10 of each type and size.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Asphalt Pavers: Hanover Architectural Products or equivalent.
 - 1. Hanover Architectural Products, Inc; Asphalt Block: www.hanoverpavers.com/#sle.

2.02 MATERIALS

- A. Pavers: Fibrous asphaltic block; 8x8 inch size, 2 inch thick; natural, exposed aggregate finish or as selected by Landscape Architect or Owner.
- B. Adhesive: Neoprene modified asphaltic type, recommended by paver manufacturer.
- C. Joint Filler: Clean, sharp sand.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate is level, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this section.
- B. Verify gradients and elevations of substrate are correct.

3.02 PREPARATION

- A. Apply primer or surface conditioner to surface of substrate in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Apply adhesive and pavers in accordance with manufacturer's instructions.

- B. Place paver units in hexagon pattern or as indicated on the drawings, from straight reference edge.
- C. Place half units or special shaped units at edges and interruptions. Maintain tight joints.
- D. Machine roll units to level surface.
- E. Sweep clean, sharp sand into paver joints.
- F. Fog spray surfaces with water to ensure wetting of joint filler.
- G. Sweep excess filler from surface of pavers.

END OF SECTION

PAVEMENT MARKINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, curb markings, and fire lanes.
- B. Roadway lane markings and crosswalk markings.

1.02 RELATED REQUIREMENTS

- A. Section 32 1250 - Site Paving.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Parking Lot Striping: By the linear foot. Includes preparation of substrate, painting, clean up.
- B. Roadway Lane Marking: By the linear foot. Includes preparation of substrate, painting, clean up.

1.04 REFERENCE STANDARDS

- A. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- C. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

1.05 SUBMITTALS -- NOT APPLICABLE**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store paint and materials in manufacturer's containers in a suitable storage facility until use.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.
 - 1. Roadway Markings: As required by authorities having jurisdiction.
 - 2. Parking Lots: Yellow on concrete pavements or white on bituminous pavements or as indicated on drawings.
 - 3. Handicapped Symbols: Blue.
- B. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.
- C. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings. Thermoplastic markings must be completely removed by scraping, sandblasting, or mechanical abrasion.
- D. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
 - 2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
 - 3. Sandblasting: Use equipment of sufficient size and capacity.
- E. Where oil or grease are present, scrub affected areas with several applications of an approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- F. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- G. Temporary Pavement Markings: When required or directed by Engineer or Owner, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Owner's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than or greater than manufacturer's instructions.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.

- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
 - 1. Apply paint in one coat only or as indicated on the drawings.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Length Tolerance: Plus or minus 1 inch.
 - 4. Width Tolerance: Plus or minus 1/8 inch.
- G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
 - 1. Conduct operations in such a manner that necessary traffic can move without hindrance.
 - 2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
 - 3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
 - 4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
 - 5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
 - 6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.
- H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
 - 1. Mark the International Handicapped Symbol at indicated parking spaces.
 - 2. Hand application by pneumatic spray is acceptable.
- I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

- F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SEEDING**PART 1 GENERAL****1.01 Section Includes**

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Seeding, mulching and fertilizer.
- D. Maintenance.

1.02 Related Requirements

- A. Section 31 2200 - Grading.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Topsoil:
 - 1. Basis of Measurement: By the cubic yard.
 - 2. Basis of Payment: Includes topsoil, placing topsoil.
- B. Grassed Areas:
 - 1. Basis of Measurement: By the square yard.
 - 2. Basis of Payment: Includes preparation of subsoil, preparation of topsoil, placing topsoil, seeding, watering and maintenance for 90 days or until established.

1.04 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 Submittals

- A. Topsoil samples.
- B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.
- C. Maintenance Contract.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS**2.01 SEED MIXTURE**

- A. Seed Mixture: As determined by the Landscape Architect or Owner.

2.02 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.03 ACCESSORIES

- A. Mulching Material: Hay, oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry.
- B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Herbicide.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Inorganic fiber.
- H. Edging: Galvanized steel.

2.04 TESTS

- A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 31 2200.
- B. Place topsoil in accordance with Section 32 9119.
- C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to roller compaction.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 SEEDING

- A. Apply seed per seed providers recommendation.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Planting Season: Dependent upon seed species.

- D. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- E. Roll seeded area with roller not exceeding 112 lbs.
- F. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- G. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- H. Following germination, immediately re-seed areas without germinated seeds that are larger than 24 by 24 inches.

3.05 HYDROSEEDING

- A. Apply seeded slurry per seed providers recommendations.
- B. Do not hydroseed area in excess of that which can be mulched on same day.
- C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- E. Following germination, immediately re-seed areas without germinated seeds that are larger than 24 by 24 inches.

3.06 PROTECTION

- A. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36 inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.07 Maintenance

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
- D. Mow grass at regular intervals to maintain at a maximum height of 3 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- E. Neatly trim edges and hand clip where necessary.
- F. Immediately remove clippings after mowing and trimming.
- G. Water to prevent grass and soil from drying out.
- H. Roll surface to remove minor depressions or irregularities.
- I. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

- J. Immediately reseed areas that show bare spots.
- K. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

SODDING**PART 1 GENERAL****1.01 Section Includes**

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Sod installation.
- E. Maintenance.

1.02 Related Requirements

- A. Section 31 2200 - Grading.
- B. Section 31 2323 - Fill.
- C. Section 32 9119 - Landscape Grading.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Topsoil:
 - 1. Basis of Measurement: By the cubic yard.
 - 2. Basis of Payment: Includes topsoil, placing topsoil.
- B. Sodded Areas:
 - 1. Basis of Measurement: By the square yard.
 - 2. Basis of Payment: Includes preparation of subsoil, preparation of topsoil, placing topsoil, sodding, watering and maintenance.

1.04 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.
- B. Grass: Bermuda, St. Augustine, Buffalo; other acceptable grasses suitable for the region and climate.

1.05 Reference Standards

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.06 Submittals

- A. Certificate: Certify grass species and location of sod source.
- B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

- A. Sod Producer: Company specializing in sod production and harvesting, and certified by the State of Texas.
- B. Installer Qualifications: Company approved by the sod producer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration.

- B. Do not deliver more sod than can be laid within 48 hours.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
 - 1. Thickness: "Thick" sod, minimum 1 inch and maximum 1-3/8 inch topsoil base.
 - 2. Machine cut sod and load on pallets in accordance with TPI (SPEC) Guidelines.
- B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
- C. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions unless otherwise indicated:
 - 1. Nitrogen: 16 percent.
 - 2. Phosphoric Acid: 8 percent.
 - 3. Soluble Potash: 8 percent.
- D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

2.02 ACCESSORIES

- A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.
- B. Wire Mesh: Interwoven hexagonal plastic mesh of 2 inch size.
- C. Edging: Galvanized steel, painted steel.
- D. Herbicide.

2.03 SOURCE QUALITY CONTROL

- A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

- A. Prepare subgrade in accordance with Section 31 2200.
- B. Place topsoil in accordance with Section 32 9119.
- C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Where new sod adjoins existing grass areas, align top surfaces.
- E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.
- F. On slopes 4 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- G. Prior to placing sod, on slopes exceeding 4 inches per foot or where indicated, place wire mesh over topsoil. Securely anchor in place with wood pegs sunk firmly into the ground.
- H. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- I. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.05 Maintenance

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Provide maintenance of sodded areas for one month from Date of Substantial Completion.
- D. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
- E. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- F. Neatly trim edges and hand clip where necessary.
- G. Immediately remove clippings after mowing and trimming.
- H. Water to prevent grass and soil from drying out.
- I. Roll surface to remove irregularities.
- J. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- K. Immediately replace sod to areas that show deterioration or bare spots.
- L. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

DISINFECTION OF WATER UTILITY PIPING SYSTEMS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1416.
- B. Testing and reporting results.

1.02 RELATED REQUIREMENTS

- A. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Disinfection: By the linear foot. Includes preparing, disinfecting, testing, and reporting.

1.04 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2011.
- B. AWWA C651 - Disinfecting Water Mains; 2005.

1.05 SUBMITTALS

- A. Test Reports: Indicate results comparative to specified requirements.
- B. Certificate: From authority having jurisdiction indicating approval of water system.
- C. Disinfection report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- D. Bacteriological report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water complies, or fails to comply, with bacterial standards of _____.

1.06 QUALITY ASSURANCE

- A. Testing Firm: Company specializing in testing potable water systems, approved by governing authorities of the State in which the Project is located.
- B. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS**2.01 DISINFECTION CHEMICALS**

- A. Chemicals: AWWA B300, Hypochlorite.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that piping system has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water service purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.
- G. Pressure test system to 200 psi. Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

- A. Test samples in accordance with AWWA C651.

END OF SECTION

SITE CONCRETE ENCASEMENT, CRADLES, SADDLES AND COLLARS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. All work required to install and complete all concrete encasements, cradles, saddles and collars.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation.
- B. Section 31 2316.13 - Trenching.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Encasement, Cradles, Saddles, and Collars: By the cubic yard. Includes formwork, concrete, placement accessories, consolidating and curing.

1.04 REFERENCES

- A. Texas Department of Transportation Standard Specification, Item 420 – Concrete for Structures.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's data on manufactured products showing compliance with specified requirements.
- B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

1.06 QUALITY ASSURANCE

- A. The testing laboratory shall sample and test concrete in accordance with geotechnical report unless otherwise indicated.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Concrete: Shall conform to Class B in accordance with Item 420, "Concrete for Structures", TxDOT Standard Specifications.
- B. Reinforcement: If required, shall be Grade 60, deformed bars, new billet steel.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Concrete Encasement
 1. The trench shall be excavated and fine graded to a depth conforming with details and sections shown on the plans.
 2. The pipe shall be securely tied down to prevent flotation and supported by precast concrete blocks of the same strength as the concrete for encasement.
 3. Encasement shall then be placed to a depth and width conforming with details and sections shown on the plans.
- B. Concrete Cradles
 1. The trench shall be prepared and the pipe supported in the same manner as described in this Section.
 2. Concrete cradles shall be constructed in accordance with details and sections shown on the plans.

- C. Concrete Saddles
 - 1. Pipe to receive concrete saddle shall be backfilled in accordance with Section 31 2316.13 – Trenching to the spring line.
 - 2. Concrete placed to a depth and width conforming with details and sections shown on the plans.
- D. Concrete Collars
 - 1. Concrete collars shall be constructed in accordance with details and sections shown on the plans.

3.02 CLEANING

- A. Properly dispose of all debris, trash containers, residue, remnants and scraps which result from the work of this Section.

END OF SECTION

SITE CASTINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Castings shall include labor, materials, equipment and incidentals to construct manhole frames and covers, catch basin inlet frames and grates, trench drain frames and grates, and area drains.
- B. Castings include metal items which are not a part of the miscellaneous metal fabrications or metal systems in other sections of these specifications.

1.02 RELATED SECTIONS**1.03 SUBMITTALS**

- A. Shop Drawings:
 - 1. Submit Shop Drawings to the Engineer for the fabrication and erection of all casting assemblies. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
 - 2. Include setting drawings for location and installation of castings and anchorage devices.
 - 3. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.

1.04 QUALITY ASSURANCE

- A. Shop Assembly
 - 1. Preassemble items in the shop to the greatest extent possible, so to minimize field splicing and assembly of units at the site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 2 PRODUCTS**2.01 MANHOLE FRAMES AND COVERS**

- A. Drainage Manholes
 - 1. Material:
 - a. Cast iron conforming to ASTM A 48, Class 30A.
 - 2. Size:
 - a. As shown on the Drawings.
 - 3. Construction:
 - a. Heavy duty suitable for H-20 loading, with bearing surfaces between frames and covers machined, fitted together, and match marked to prevent rocking.
 - 4. Product and Manufacturer:
 - a. Drainage manhole frames and covers shall be as manufactured by:
 - 1) As shown on plans for type "C" inlet.
 - 2) Alamo Ironworks No. 860-72, or equal, for Junction Box.
- B. Sanitary Sewer Manholes
 - 1. Material:
 - a. Cast iron conforming to ASTM A 48, Class 30.
 - 2. Size:
 - a. As shown on the Drawings.
 - 3. Construction:

- a. Heavy duty suitable for H-20 loading, with bearing surfaces between frames and covers machined, fitted together, and match marked to prevent rocking.
- 4. Product and Manufacturer:
 - a. Manhole frames and covers shall be as shown on the Plans, or as manufactured by an approved vendor authorized by the local jurisdictional authority.

2.02 CATCH BASIN INLET FRAMES AND GRATES

- A. Catch Basin Inlets
 - 1. Material:
 - a. Ductile iron conforming to ASTM A 536.
 - 2. Size:
 - a. As shown on the Drawings.
 - 3. Construction:
 - a. Heavy duty suitable for H-20 loading, with machine bearing surfaces.

2.03 TRENCH DRAIN FRAMES AND GRATES

- A. Trench Drain Frames and Grates
 - 1. Material:
 - a. Ductile iron conforming to ASTM A536.
 - 2. Size:
 - a. As shown on the Drawings.
 - 3. Construction:
 - a. Heavy duty suitable for H-20 loading, with machine bearing surfaces.
- B. Trench Drain: As shown on the Plans, or as manufactured by an approved vendor authorized by the local jurisdictional authority.

2.04 AREA DRAINS

- A. Area Drains
 - 1. Material:
 - a. Ductile iron conforming to ASTM A536.
 - 2. Size:
 - a. As shown on the Drawings.
 - 3. Construction:
 - a. Heavy duty suitable for H-20 loading, with machine bearing surfaces.

2.05 DESIGN AND FABRICATION

- A. Design all frames, covers, and grates to prevent rocking and rattling under traffic.
- B. Fabricate castings true to pattern so that component parts fit together.

2.06 FINISH

- A. Shall be in accordance with manufacturer's recommendation, unless shown or specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Follow manufacturer's printed instructions and Shop Drawings.

- B. Set castings accurately to required locations, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork.
- C. Area and planting drains shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION

Item No. 303
Polymer Concrete Manholes

303.1 Description

Provide labor, materials, equipment and incidentals necessary to construct manholes and cleanouts complete with covers, fittings, and other appurtenances, in accordance with the details and/or called out in the Drawings. Polymer Concrete Manholes are required for all wastewater mains 18 inches and larger.

303.2 Quality Assurance

Polymer Concrete Manholes:

- A. Certification from manufacturer that polymer concrete manhole design meets or exceeds the load and strength requirements of ASTM C478 and ASTM C857, reinforced in accordance with ASTM C478 or ACI 440.1R.
- B. Proof of independent chemical resistance testing conducted in accordance with ASTM C267.
- C. Manufacturer must provide references of 10 previous polymer concrete projects including scope in the last 5 years performed with both the owner and contractor for reference and review.

303.3 Submittals

Submittals must be in accordance with the General Conditions and must include:

- A. Shop Drawings:
 - 1. Drawings and data covering manhole sections. These drawings must include manhole designation matching the plans, invert elevations and diameters for each manhole.
- B. Product Data:
 - 1. Manhole cover and ring.
 - 2. Engineer to include other products as specified.
 - 3. Certification from the manufacturer that polymer concrete manhole design meets or exceeds the load and strength requirements of ASTM C478 and ASTM C857, reinforced in accordance with ASTM C478 or ACI 440.1R.

303.4 Standards

The applicable provisions of the following standards shall apply as if written here in their entirety:

A. ASTM International (ASTM) Standards:

ASTM A48	Specification for Gray Iron Castings
ASTM C267	Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes using Rubber Gaskets
ASTM C478	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C497	Test Methods for Concrete Pipe, Manhole Sections, or Tile
ASTM C579	Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes
ASTM C857	Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM D2240	Test Method for Rubber Property - Durometer Hardness
ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C33	Concrete Aggregates
ASTM C990	Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants
ASTM C923	Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM D6783	Specification for Polymer Concrete Pipe

B. American Concrete Institute (ACI) Standards:

ACI 440-1R-15	Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars

C. American National Standards Institute (ANSI) Standards:

ANSI A21.10	American National Standard for Gray Iron and Ductile Iron Fittings, 3 through 48 Inches for Water and Other Liquids

D. Delivery and Storage

1. Inspect precast polymer concrete sections upon delivery and reject any cracked or otherwise visibly defective units.

303.5 Materials**A. General****1. Concrete and Mortar:**

- a. Concrete, mortar and non-shrink grout for all cast-in-place bases must be as specified in TxDOT Standard Specification Item No. 421, "Hydraulic Cement Concrete".
- b. The minimum compressive strength for concrete is 3000 psi.

B. Manufactured Products**1. Polymer Concrete Manholes:****a. Riser Sections:**

Provide base riser section with monolithic floors, unless shown otherwise in the Drawings.

- i. Provide riser sections joined with bell and spigot/ship-lap design seamed with butyl mastic (ASTM C990) and or rubber gaskets (ASTM C443) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole structure. Joints shall meet the testing requirements without the use of an external joint wrap.
 - ii. Construct riser sections for polymer concrete manholes from standard polymer concrete manhole sections of the diameter indicated in the Drawings. Use various lengths of polymer concrete manhole sections in combination to provide the correct height with the fewest joints. Lifting inserts shall not fully penetrate the wall.
- b. Resin: The manufacturer must use only polyester or vinyl ester resin systems designed for use with this particular application. Resin additives such as curing agents, pigments, dyes, fillers and thixotropic agents, when used, must not be detrimental to the manhole. Minimum resin content shall not be less than 7 percent by weight.
 - c. Aggregate: All aggregate, sand and quartz powder must meet the requirement of ASTM C33, where applicable. Limestone aggregates shall not be used.
 - d. Polymer concrete must have a minimum compressive strength of 9000 psi when measured in accordance with ASTM C497.
 - e. Elastomeric Gaskets: Gaskets must be suitable for the service intended and must meet the requirements of ASTM C443. Assembled joints shall meet the testing requirements of ASTM C443 without the use of an external joint wrap. Pipe to manhole connections shall be accomplished with connectors meeting ASTM C923 for both materials and performance requirements. Proof of connector testing can be requested from connector manufacturer.
 - f. Marking and Identification: Each manhole must be marked with the manufacturer's name and production date.
 - g. Invert Channel: Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe to manhole connections. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab for buoyancy concerns can be addressed with cementitious concrete material.

- h. Manholes must be reinforced per ASTM C478 or ACI 440.1R and designed to withstand all live loads and dead loads as described in the Drawings. Manhole wall thickness must be designed to resist hydrostatic pressures with a minimum safety factor of 2.0 for full depth conditions from grade to invert.
 - i. Materials needed for grouting and patching must be a polyester mortar compound provided by the manufacturer or as approved by the manufacturer.
 - j. Approved Manufacturers:
 - i. Armorock Polymer Concrete.
 - ii. U.S. Composite Pipe, Inc. (a division of Thompson Pipe Group).
 - iii. Approved equal.
2. Non-Metallic Manhole Rings and Covers
- a. All rings and covers must be made from high strength nonmetallic fiber reinforced polymer/composite materials. The material must be a resin thermoset matrix that can be reinforced with continuous filament engineered fabrics, fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing structure(s). Sealing gaskets must be bonded to the frame continuously at the interface with the cover to reduce wear, shock, noise, malodors and infiltration.
 - b. Rings and covers intended for traffic service must be capable of withstanding AASHTO M306: Proof Testing (includes items such as frames, covers, etc.).
 - c. Fabricate rings and covers to conform to shapes, dimensions, and with wording or logos shown in the Drawings.
 - d. Molding Process:
 - i. Before the moldings are removed from the molding operation, they must be thoroughly de-flashed and cleaned at the parting lines, holes, notches and all exposed edges.
 - ii. If using a lock or latch, these must be independent of the method used to open the cover to ensure the cover can be opened in the event of lock or latch failure.
 - iii. Covers and frames must be compression molded under high pressures (>0.5 tons/sq. inch of x-y surface area) and high temperatures (>200 deg F).
 - iv. Metal reinforcements or metal hinges molded within the composite will not be permitted. Small non-stress bearing pieces of metal may be encapsulated or attached.
 - e. All rings and covers must be molded and assembled in the United States in accordance with the requirements of AASHTO M306.
 - f. Covers must be provided with a positive sealing mechanism utilizing 316 stainless steel hardware with nuts molded in or attached at pre-molded designated points of the frame and must be Teflon coated. Other equivalent locking mechanisms must be approved by the Engineer.
 - g. Composite covers must be detectable by metal detectors.

- h. Composite covers must be furnished with two concealed pick holes molded with 316 stainless steel inserts. An additional 316 stainless steel lifting clip must be molded into the top of the cover to facilitate removal and replacement.
 - i. Composite covers must have provisions for 316 stainless steel threaded inserts molded into the bottom surface to accommodate monitoring and remote transmission sensors and antenna utilized by the utility. Antenna placed on the bottom side must have the capability to transmit through the cover without the need to drill and install antenna on the upper surface.
 - j. Markings: Covers and frames must have the following molded into the substrate of the cover:
 - i. Name (or abbreviation) of molder.
 - ii. Country of origin.
 - iii. Molding date.
 - iv. Indication that material is non-metallic.
 - k. Approved Manufacturers:
 - i. Composite Access Products, L.P.
 - ii. Approved equal.
3. Manhole Grade Adjustment Rings
- a. Grade adjustment rings must be made of high-density polyethylene (HDPE) meeting ASTM D4976 or expanded polypropylene meeting ASTM D3575 and ASTM D4819-13.
 - b. Provide adhesive/sealant between each ring per the manufacturer's requirements.
 - c. Approved Manufacturers:
 - i. Ladtech, Inc.
 - ii. PRO-RING by Cretex Specialty Products.
 - iii. Approved equal.
4. Pipe Connections:
- a. Field connections to manholes must use a compression fit into the cored wall and use stainless steel bands to secure the gasketed connection to the pipe.
 - b. Approved Manufacturers:
 - i. ADS – Insert-a-Tee.
 - ii. Trelleborg – Kor-N-Seal.
 - iii. Approved equal.
5. Manhole Vent:
- a. Vent is to be constructed of ductile iron per NBU standard details. Vent is to include #16 316 stainless steel screen. All hardware is to be 316 stainless steel.
 - b. As indicated in the Drawings, provide vents equipped with an inverted check valve. Check valve must automatically seal the vent pipe to prevent inflow of water into the

lines when submerged and automatically reset when not submerged. Float must be constructed of 316 stainless steel.

- c. As indicated in the Drawings, provide vents equipped with odor control canisters equipped with filter media designed to scrub H₂S odors.
- d. Ductile iron pipe and fittings must be lined with factory installed Protecto 401 Ceramic Epoxy Lining by Enduron or American Polybond Plus (fusion bonded epoxy and fusion bonded polyethylene) or approved equal.
- e. Coat vents, valves, and above grade ductile iron pipe and fittings per Item 530 "High Performance Coatings."
- f. Approved Manufacturers:
 - i. Wager Company.
 - ii. Approved equal.

303.6 Construction Methods

A. Installation

1. Manhole Sizing: Manhole diameters are to be as indicated in the Drawings and as indicated below. If there is a conflict between the Drawings and these requirements, the larger manhole diameter will be required.
 - a. Pipe Diameters 18 Inches and Smaller: Provide 48-inch inside diameter manholes.
 - b. Pipe Diameters 24 to 27 Inches: Provide 60-inch inside diameter manholes.
 - c. Pipe Diameters 30 Inches and Larger: Provide 72-inch inside diameter manholes.
2. Foundation Support: Manholes must be founded on stable subgrade. Precast base units must be founded on a minimum 6-inch-thick layer of compacted course aggregate bedding. A pipe section with a prefabricated tee manhole and half the length of the adjoining pipe sections on each side must be founded on a minimum 6-inch layer of Class A concrete. The cradle is to extend to the trench walls and to the spring line of the pipe.
3. Manhole Base:
 - a. Precast Manhole Base: The applicable details as indicated in the Drawings apply. Place the manhole base at an elevation that allows the invert to match the pipe flowline.
 - i. The precast manhole base must form a watertight seal with the bottom of the manhole. This may be accomplished by **[placing a continuous 1-inch ring of epoxy grout or using a rubber gasket]** at the joint of the manhole and manhole base or other pre-approved methods.
 - b. Give the concrete portion of all inverts within the manholes a smooth steel trowel finish.
 - c. The first section of pipe extending out a minimum of 24 inches from each side of the manhole base must be supported by lean concrete as part of the manhole base. No additional payment will be made for this concrete cradle; the sum must be included in the bid price for the manhole.
4. For precast manholes, the tops of the manholes will be set to proper elevation by using a

predetermined length of the bottom section of the manhole riser and using standard lengths for the other sections of the riser pipe.

5. Inverts: Construct invert channels to provide a smooth waterway with no disruption of flow at the connection between the pipe and manhole. The channel depth at the point where a pipe connects to the manhole wall, for pipes 24 inches in diameter and smaller, must be a minimum of 3/4 of the diameter of the pipe, with the top of the channel being a smooth transition between the inlet and outlet pipe connections. For manholes connecting to larger pipe diameters, the channel depth must be equal to the full pipe diameter. Changes in flow direction must be constructed using smooth, long radius sweeps. Inlet and outlet pipe grades must be carried through the centerline of the manhole with a minimum slope of 2.5 percent between the inlet and outlet pipe inverts or 0.10 feet, whichever is greater. Where wastewater lines enter the manhole above the outlet flowline, the invert must be filleted to the flowline of the manhole.
6. Non-Metallic Manhole Rings and Covers: Install composite frames and covers according to approved Shop Drawings, instructions in related specifications and details, and written installation instructions from manufacturer. Set units accurately at required locations to proper alignment and elevation. Keep units plumb, level, true, and free of trash. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.
7. All adjustments to the manhole lid and cover must be completed prior to the placement of final roadway surface and/or final grading.
8. Cleanouts: Provide a cleanout at the ends of all sewer lines unless a manhole is provided at that point. Construct cleanouts in accordance with the details shown in the Drawings.
9. Drop Manholes: Install a drop manhole piping assembly in all cases where the distance between the incoming pipe and the floor of the manhole is 2 feet or more. External drop assemblies must be encased in concrete as indicated in the Drawings.

B. Grouting

1. Use the polyester mortar for grouting within 20 minutes after mixing. Discard mortar which has begun to take an initial set. Do not mix mortar with additional cement or new mortar.

C. Corrosion Protection

1. All exposed concrete surfaces on the interior of the manhole must be coated as indicated in the Contract Documents.
2. Seal all joints with an external Cretex Wrap, or approved equal, as indicated on the standard details to prevent infiltration.

303.7 Acceptance Testing for Wastewater Manholes

The Contractor shall notify the Inspector and Engineer 48 hours prior to beginning of manhole testing. The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following:

- A. All manholes must pass the leakage test.
- B. The Contractor shall test each manhole (after assembly and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a

hydrostatic test, vacuum test, or other methods approved by the Engineer.

C. The Contractor is hereby instructed to conduct either Vacuum Testing or Hydrostatic Testing in the following manner:

1. Vacuum Testing: Manholes shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place.
 - a. Drop-connections and gas sealing connections shall be installed prior to testing.
 - b. The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole.
 - c. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc.
 - d. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole.
 - e. Only a cementitious coating may be applied.
 - f. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole.
 - g. The test head shall be inflated in accordance with the manufacturer's recommendations.
 - h. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off.
 - i. With the valve closed, the level vacuum shall be read after the required test time.
 - j. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test.
 - k. The required test time is 2 minutes.
2. Hydrostatic Testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water.
 - a. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses.
 - b. At the conclusion of the 24-hour saturation period, the manhole shall be filled to the top and observed.
 - c. Any measurable loss within a 30-minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed.
 - d. All effort, materials, or other costs shall be solely at the Contractor's expense.
3. Acceptance: Any manhole which fails the initial test must be repaired with a polyester mortar compound per manufacturer's specifications or other suitable material based on the material of which the manhole is constructed.
4. The manhole shall be retested as described above until a successful test is attained.
5. After a successful test, the temporary plugs will be removed.

6. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
 - a. Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic/vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired.
 7. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed.
 8. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with a minimum of 12 inches thickness of flowable fill to one foot above the top of the cone section to allow for the concrete ring encasement.
 9. After abrading and cleaning, additional protective coating material shall be applied to the repair area.
 10. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations.
- D. If a sanitary manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re-tested. Should the test fail a second time, Contractor shall perform another leak test utilizing the other testing option in this specification. Should the test fail the third time, Contractor shall remove and replace the manhole and perform all the necessary test at no additional cost to NBU. Manholes shall not be accepted until it passes all tests.
- E. Engineer of Record must witness all tests over the Edwards Aquifer Recharge Zone (EARZ).
- F. Inspection.

The Engineer or designated representative shall make a visual inspection of each manhole after it has passed the testing requirements and is considered to be in its final condition. The inspection shall determine the completeness of the manhole; any defects shall be corrected to the satisfaction of Engineer or designated representative.

303.8 Measurement

Polymer Concrete Manhole Structures will be measured as each structure complete in place.

303.9 Payment

Payment for completed manholes of the type indicated shall be made at the unit bid price for each. The unit bid price shall include all labor, equipment, materials, testing, time and incidentals necessary to complete the work.

Payment when included as a contract pay item, will be made under the following:

Pay Item: Polymer Concrete Manhole ___ Dia, Per Each

END

Item No. 510
Pipe**510.1 Description**

This item shall consist of furnishing and installing all pipe and/or materials for constructing water mains, force mains, sanitary sewers, laterals, stubs, and service connections including all applicable Work such as jointing, prescribed under this item in accordance with the provisions of the Edwards Aquifer Protection Ordinance, when applicable, and New Braunfels Utilities Design Criteria Manual. The pipe shall be of the sizes, types, class and dimensions indicated or as designated by the Engineer/Architect (E/A) and shall include all joints or connections to new or existing mains, pipes, sewers, manholes, etc., as may be required to complete the Work in accordance with specifications and published standard practices of the trade associations for the material specified and to the lines and grades indicated on the plans. This item shall include any pumping, bailing, drainage and Item No. 121, "Trench Safety Systems" for trench walls, when indicated or applicable. Trenching and back fill shall be covered under Item No. 120, "Utility Trenching and Backfill." Acceptance testing shall be covered under Item No. 515, "Testing and Acceptance."

510.2 Submittals

- A. Furnish Shop Drawings, product data, design calculations and test reports as described below:
1. Certified copies of mill tests confirming the type of materials used in steel plates, mill pipe flanges and bolts and nuts to show compliance with the requirements of the applicable standards.
 2. Complete and dimensional working drawings of all pipe layouts. Shop Drawings shall include the grade of material, size, wall thickness of the pipe and fittings, type and location of fittings and the type and limits of the lining and coating systems of the pipe and fittings.
 3. Product data to show compliance of all couplings, supports, fittings, coatings and related items.

510.3 Standards

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
1. American Water Works Association (AWWA):

AWWA C104	Cement-Mortar Lining for Ductile Iron Pipe and Fittings
AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber Gasket Joints for Ductile-Iron
AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron

AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast, Sizes 3 inches through 64 inches
AWWA C153	Ductile-Iron Compact Fittings
AWWA C600	Installation of Ductile Iron Mains and their Appurtenances
AWWA C602	Cement-Mortar Lining of Water Pipelines, 4 inches and larger in Place.
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) and and Molecularly Oriented Polyvinly Chloride (PVCO) Pressure Pipe and Fittings.
AWWA C800	Underground Service Line Valves and Fittings
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches through 60 inches
AWWA M23	PVC Pipe – Design and Installation.
AWWA M41	Ductile – Iron Pipe and Fittings

2. ASTM international (ASTM):

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated PVC Pipe (SDR) Series
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	“Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals”
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679 & Annex	Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F1674	Standard Test Method for Joint Restraint Products for Use with PVC Pipe

3. NSF International

NSF 61	Drinking Water System Components – Health Effects

510.4 Materials

A. Fire Lines

Fire line leads and fire hydrant leads shall be ductile iron, only.

B. Force Mains

All wastewater force mains shall be constructed of the following pipe materials:

- a. Ductile iron pipe of pressure class 250 minimum for pipe greater than 12-inch size, and ductile iron pipe pressure class 350 for pipe 12-inch size and smaller,
- b. D2241 PVC Pressure Class 200 (SDR 21) for pipe 12-inch size and smaller, integrally colored green,
- c. PE4710 HDPE DR-9 with a minimum diameter of four (4) inches,
- d. Polyvinyl Chloride Pipe meeting all requirements of section 510.4.D, integrally colored green,
- e. Ductile iron wastewater pipe shall be in accordance with New Braunfels Utilities Standard Products List and shall have a corrosion resistant interior lining acceptable to the Owner.

C. Ductile Iron Water Mains

- a. All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc., or shall be Factory Mutual approved for fire service.
- b. Ductile Iron Pipe - Pipe shall be ductile iron pipe meeting all requirements of standards as follows:
 - i. For push-on and mechanical joint pipe: AWWA C151
 - ii. For flanged pipe: AWWA C115

Barrels shall have a nominal thickness required by Table 1 of AWWA C115, which thickness corresponds to Special Class 53 in sizes through 54 inch, and Class 350 in 60 and 64-inch sizes. Flanges shall be ductile iron (gray iron is not acceptable); they shall be as shown in ANSI/AWWA C115/A21.15 and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. These flanges are the same in all respects as flanges shown in ANSI/AWWA C110/A21.10 for fittings and are standard for all flanges used with pipe, valve, and equipment units in the water distribution and wastewater force main systems. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by New Braunfels Utilities will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

- iii. Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile iron pipe shall be minimum Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile iron pipe and flanges shall meet the following minimum physical requirements:

1. Grade 60-42-10:

- a. Minimum tensile strength: 60,000 psi (414 mPa).

- b. Minimum yield strength: 42,000 psi (290 mPa).
 - c. Minimum elongation: 10 percent.
 - 2. Grade 70-50-05 (for AWWA C115 pipe):
 - a. Minimum tensile strength: 70,000 psi (483 map).
 - b. Minimum yield strength: 50,000 psi (345 mPa).
 - c. Minimum elongation: 5 percent.
- c. Ductile Iron Fittings:
 - i. Fittings shall be push-on, flanged or mechanical joint as indicated or approved and shall meet all requirements of standards as follows:
 - 1. Sizes 4 inch through 24 inch: AWWA C110 or AWWA C153
 - 2. Sizes larger than 24 inch: AWWA C110.
- d. Marking

Each pipe joint and fitting shall be marked as required by the applicable AWWA specification. This includes in all cases: Manufacturer's identification, Country where cast, year of casting, and "DUCTILE" or "DI". Barrels of flanged pipe shall show thickness class; others shall show pressure class. The flanges of pipe sections shall be stamped with the fabricators identification; fittings shall show pressure rating, the nominal diameter of openings and the number of degrees for bends. Painted markings are not acceptable.
- e. Linings and Coating:
 - i. Interior surfaces of all ductile iron water pipe shall have cement-mortar lining in accordance with AWWA C104 and bituminous seal coat.
 - ii. Interior surfaces of all ductile iron wastewater and force main fittings shall be coated with Protecto 401. Lining primers, applications, and thicknesses shall be in accordance with manufacturer's recommendations for sanitary sewer applications, but shall not be less than 40 mils.
 - iii. Exterior surfaces for buried pipe and fittings shall be coated with a 1 mil bituminous coating in accordance with AWWA C110 and C151, unless specified otherwise.
 - iv. Exterior surfaces for pipe and fittings installed above grade or within vaults shall be coated as required by the applicable coating specification.
- f. Joint Materials
 - i. Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C111.
 - ii. Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.

- iii. Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth-reinforced rubber or neoprene material, preferably of deformed cross section design and shall meet all applicable requirements of ANSI/AWWA A21.11/C111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.
 - iv. Tee-head bolts, nuts and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile iron conforming to ASTM A 536; either shall be fabricated in accordance with ANSI/AWWA A21.11/C111.
 - v. Hex head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.
 - vi. Either Tee-Head or Hex-Head bolts, nuts and washers as required, shall be protected with bonded fluoro-polymer corrosion resistant coating where specifically required by the E/A.
 - vii. All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.
- g. Polyethylene Film Wrap
- All iron pipe, fittings and accessories shall be wrapped with standard 8 mil (minimum) low density polyethylene film or 4-mil (minimum) cross laminated high-density polyethylene conforming to AWWA C105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling.
- D. Polyvinyl Chloride (PVC) Water Pipe
- a. General
- All polyvinyl chloride (PVC) water pipe shall be of the rigid (unplasticized) type and must bear the National Sanitation Foundation seal of approval for potable water pipe. Each joint of pipe shall consist of single continuous extrusion; bells or other components attached by solvent welding are not acceptable. Pipe shall be pressure rated at 305 psi (DR-14) or 235 psi (DR-18) as indicated. All pipe 4 inches and larger must be approved Underwriter's Laboratories for use in buried water supply and fire protection systems.
- b. Pipe shall have push-on, rubber gasket joints of the bell and spigot type with thickened integral bells with rubber gasket joints. The wall thickness of each pipe bell and joint coupling must be greater than the standard pipe barrel thickness. Clearance must be provided in every gasket joint for both lateral pipe deflection and for linear expansion and contraction. Concrete thrust blocking shall be placed behind bends and tees when required by the E/A. Concrete support cradles or blocking shall be required for support

of all fire hydrants, valves and AWWA C110 fittings; such support shall be provided for AWWA C153 fittings when required by the E/A.

c. Applicable Specifications

Except as modified or supplemented herein, PVC pipe shall meet the following standards:

- i. AWWA C900, DR 18 or DR 14 for PVC Pressure Pipe, in 4, 6, 8, 12, 16, and 24 inch nominal sizes, having Cast Iron Pipe size outside diameters.
- ii. Fittings used with PVC Pressure pipe shall be AWWA C110 or AWWA C153 compact ductile iron fittings.

d. Material Requirements

All pipe and fittings shall be made from clean, virgin, NSF approved, Class 12454B PVC. Clean reworked materials generated from the manufacturers own production may be used within the current limits of the referenced AWWA C900.

e. Marking

Permanent marking on each joint of pipe shall include the following at intervals of not more than 5 feet:

- i. Nominal pipe size and OD base (e.g., 4 CIPS).
- ii. Type of plastic material (e.g., PVC 12454B).
- iii. Dimension Ratio (e.g., DR 18).
- iv. Pressure Class (e.g., PC 235).
- v. AWWA designation with which the pipe complies (e.g., AWWA C900-16).
- vi. Manufacturer's name or trademark and production run record
- vii. The National Sanitation Foundation (NSF) mark.

E. Service Lines

a. Clamps or Saddles

Approved service clamps or saddles shall be used when tapping ductile iron pipe and PVC pipe 16 inch size and smaller. Outlets of service saddles shall be tapped with AWWA IP thread (female). External threads of corporation valve inlet must be compatible with internal threads of the service saddle.

b. Service Line Materials

1 inch service lines shall be annealed copper tubing meeting the requirements of paragraph 510.4.E.e. High Density Polyethylene (HDPE) meeting the requirements of paragraph 501.4.E.c may be allowed for 1 inch diameter service lines with approval from NBU. 2 inch diameter service lines shall be High Density Polyethylene (HDPE) meeting the requirements of paragraph 510.4.E.c and in no case shall copper tubing be allowed.

c. HDPE Tubing

- i. HDPE pipe with 1" to 2" diameter shall be PE 4710 conforming to the latest edition of AWWA C901 and ANSI/NSF Standard 61. PE 4710 shall conform to ASTM D3350 minimum cell classification PE 445574C-CC3.
- ii. Pipe shall have a minimum pressure class of 250 psi. The outside diameter of the pipe shall be based upon the CTS sizing system.
- iii. The pipe shall be marked in accordance with the standards to which it is manufactured. Markings shall include nominal size, outside diameter base (e.g. CTS), dimension ratio (e.g. DR 9), manufacturer's name or trademark, standard materials designation code (PE 4710), cell classification (e.g. PE 445574C), PE compound oxidative resistance for potable water (CC3), pressure class (e.g. PC 250), standard's designation (AWWA C901), manufacturer's production code, date of manufacture, mark of the certifying agency for potable water (such as NSF).
- iv. Color of exterior pipe product (pipe with color code E) shall be blue for potable water.
- v. Tracer wire shall be required on all HDPE Service Lines and in accordance with Paragraph 510.4.J of this Section and Item No. 512 "Conductive Trace Wire for Non-Metallic Pipe Installation".

d. HDPE Fittings

- i. Butt Fusion Fittings – HDPE Fittings shall be made of PE4710 and with a minimum Cell Classification of PE 445574C-CC3. All HDPE fittings shall meet the requirements of AWWA C901 and shall have a pressure rating equal to the pressure rating of the pipe to which the fitting is joined.
 1. Molded fittings shall be manufactured, tested and marked per ASTM D3261.
 2. Fabricated fittings shall be manufactured, tested and marked per ASTM F2206, or individual fittings standards.
 3. Socket fittings shall meet ASTM D2683. Fittings shall be butt fusion welded, made of PE 4710 material with the same minimum cell classification used for the service line.
- ii. Electrofusion Fittings - Fittings shall be PE4710, with a minimum Cell Classification of PE 445574C-CC3. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
- iii. Flanges and Mechanical Joint adapters (MJ adapters) shall be PE4710, with a minimum Cell Classification of PE 445574C-CC3. Flanged and MJ adapters can

be made to ASTM D3261 or if machined, must meet the requirements of ASTM F2206. Flanges and MJ adapters shall have a pressure rating equal to the pipe unless otherwise specified on the plans. Markings for molded or machined flange adapters or MJ adapters shall be per ASTM D3261. Fabricated (including machined) flange adapters shall be per ASTM F2206.

- iv. Mechanical Fittings for service pipes - Three primary mechanical fittings or connections can be used, which are: Stab or insert type; compression type; and clamp ring. Per MAB-4, "Internal stiffeners should be used for all mechanical fittings".
 - v. Mechanical fittings shall be designed to restrain and to prevent pull-out or rotation.
- e. Copper Tubing

All copper service tubing shall be 1" diameter annealed seamless Type K water tube meeting ASTM B88 and rated at 150 psi working pressure. The tubing shall be homogenous throughout and free from cracks, holes, crimping, foreign inclusions or other defects. It shall be uniform in density and other physical properties.

Nominal Tube Size, inches	Outside Diameter, inches		Wall Thickness, inches	
	Average	Tolerance	Average	Tolerance
1	1.125	± 0.0035	0.065	± 0.0045

f. Service Connection Fittings

All fittings used in customer service connection - tapping mains, connecting meters, etc. must be currently listed on the Standard Products List, or called for in the New Braunfels Utilities Standard Details.

g. Brass Fittings

- i. All brass valves, couplings, bends, connections, nipples and miscellaneous brass pipe fittings and accessories used in meter connections, service lines, air release piping assemblies, and wherever needed in the water distribution system, shall conform to the detail Standards, Standard Products Lists, and AWWA C800, except as herein modified or supplemented.
- ii. Unless otherwise noted, the goods described herein shall be fabricated of Waterworks No-Lead Brass meeting the requirements of ASTM B584, UNS Copper Alloy C89833 or C89836, having not more than one fifth of one percent (0.2%) total lead content by weight.
- iii. Exposed threads shall be covered with plastic caps or sheeting to protect the threads.
- iv. Brass goods of each type and class shall be compatible with other fittings in common usage for similar purposes.
- v. Brass pipe shall conform to the weights and dimensions for Extra Strong pipe given in Table A.2 of AWWA C800.

h. Corporation Valves

- i. Inlet threads of corporation valves shall be AWWA iron pipe (IP) thread (male). AWWA IP threads shall conform to ANSI/ASME B1.20.1 as required by AWWA C800 for "General Purpose (Inch) Pipe Threads". For 1" size only, corporation valve inlet threads, and the internal threads of saddles may be the AWWA taper thread conforming to AWWA C800 Figure 1 and Table 6. External threads of corporation valve inlet must be compatible with internal threads of the service saddle.
- ii. Connections of all new copper tubing, and of tubing repairs wherever possible, shall be by flared fittings. Flare connections - and compression connections when permitted - shall be designed to provide a seal and to retain the tubing, without slippage, at a working water pressure of 150 psig.
- iii. Connections of all new polyethylene tubing or pipe shall be by compression fittings. PE tubing or piping must have a stainless steel insert stiffener at the compression connections per manufacturer's recommendations.
- iv. Flanges shall conform to ANSI B16.1, Class 125, as to dimensions, drillings, etc. Copper tubing, when used, shall be Type K tubing having dimensions and weights given in Table A.1 of AWWA C800.
- v. All fittings shall be suitable for use at hydrostatic working pressures up to 150 psig (hydrostatic testing of installed systems is at 200 psig).

F. Certification

For pipes 16-inches and larger all pipe manufacturers and suppliers shall be certified by the American National Standards Institute (ANSI) for ISO 9000 compliance. It is the intent of this certification that all appropriate tests be documented with sampling criteria, frequency of testing, date of testing and date in which every piece was manufactured. A copy of the testing data to include results shall be sent with the shipment with appropriate identification as it relates to the specific shipment.

The quality of materials, the process of manufacture and the finished pipe shall be subject to inspection and approval by the E/A at the pipe manufacturing plant and at the project site prior to and during installation. Plant inspections shall be conducted at the discretion of the City Representative and shall require only 48 hours of advance notice to the manufacturer. Only manufacturers and suppliers meeting this certification will be considered as approved providers of products as listed in the Standard Products List (SPL).

G. Polyvinyl Chloride (PVC) Pipe (Non-pressure) and Fittings for Gravity Wastewater Mains

a. General

Where PVC gravity wastewater pipe is indicated, it shall conform to ASTM D3034 for pipe sizes 4 inch to 15 inch or ASTM F679 for pipe sizes 18 inch to 48 inch. Cell Class shall be as required by applicable ASTM pipe specification; pipe stiffness shall be 115 psi minimum.

Where pressure rated PVC gravity wastewater pipe is indicated, it shall conform to ASTM D2241 SDR 26 or meet the requirements of paragraph 510.4.D.

b. Joint Material

PVC pipe and fitting shall have elastomeric gasket joints conforming to ASTM D 3212; gaskets to ASTM F 477.

c. Pipe Markings

Permanent marking on the pipe shall include the manufacturer's name and/or trademark, nominal pipe size, PVC cell classification per ASTM D1784, and be marked at intervals of not more than 5 feet:

d. Fitting Markings

Fittings shall include the manufacturer's name or trademark, nominal size, material designation "PVC", PSM, and the designation, "Specification D3034".

e. Pipe Color

Pipe shall be integrally colored green by the manufacturer.

H. Fiberglass Reinforced Plastic (FRP) Pipe (Non-pressure) and Fittings for Gravity Wastewater Mains

a. General

FRP shall conform to Item No. 320 "Fiberglass Gravity Sewer Pipe".

I. Tracer Wire

Tracer wire shall be installed on all non-ferrous water mains, water services and force mains. The wire shall be installed in such a manner as to be able to properly trace all mains without loss or deterioration of signal or without the transmittal signal migrating off the tracer wire. Tracer wire shall be placed as per specifications in 512, "Conductive Trace Wire for Non-Metallic Pipe Installation".

J. Tracer Tape

Tracer tape shall be installed on all force mains in accordance with TCEQ §217.66 rules. The tape should be a minimum of 12 inches below subgrade, or a minimum of 18 inches below finished grade on areas outside the limits of pavement. The tape shall be encased in a protective, inert, plastic jacket and color-coded in accordance with APWA Uniform Color Code.

K. Concrete

Concrete shall conform to TxDOT Item No. 421, "Hydraulic Cement Concrete".

L. Material Approval

The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation into the Work is of the kind and quality that satisfies the specified functions and quality. **New Braunfels Utilities Standard Products Lists (SPL)** forms a part of the Specifications. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the E/A is still required. Should the Contractor elect to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making

the product submittal. This will expedite the review process in which the E/A, decides whether the products meet the Contract requirements and the specific use foreseen by the E/A in the design of this engineered Project. The purpose of the SPL's is to expedite review, by the E/A of Contractor product submittals. The SPL's should not be interpreted as being a pre-approved list of products necessarily meeting the requirements for a given construction Project. Items contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the E/A. The Standard Product List current at the time of plan approval will govern.

510.5 Construction Methods

A. Water Line/New Wastewater Line Separation

Installation of new water or wastewater lines shall conform to the following:

1. Where feasible, water and wastewater lines shall be no closer to each other than 9 feet between outside diameters in all directions and shall be in separate trenches.
2. If the 9 foot separation cannot be achieved, any portion of a new gravity wastewater line within 9 feet in any direction (between OD's) of a potable water line, shall be in a separate trench and constructed of AWWA C900 (DR-18) 150 psi rated PVC or ASTM D 2241 (SDR-26) 160 PSI rated PVC.
3. If the lines are parallel, they shall not be closer than 4 feet horizontally or 2 feet vertically between OD's with the wastewater lower than the water line. If the lines cross, they may be no closer than 6 inches vertically between OD's with the sewer below the water line and one standard 20 foot length of AWWA C900 (DR-18) 150 psi rated PVC or ASTM D 2241 (SDR-26) 160 PSI rated PVC shall be centered at the point of crossing the water line.
4. Unless wastewater manholes and the connection to the sewer can be made completely watertight and tested for no leakage, they must be installed so as to provide a minimum of 9 feet of horizontal clearance from an existing or proposed water line.

B. Utility and Storm Sewer Crossings

1. When the Contractor installs a pipe that crosses under a utility structure or storm sewer and the top of the pipe is within 24 inches of the bottom of the utility structure, the pipe shall be encased in concrete as specified in Item No. 505, "Concrete Encasement and Encasement Pipe", for a distance of at least 1 foot on either side of the ditch line of the utility structure or the storm sewer. Unless otherwise specified by the E/A, concrete encasement will not be required for ductile iron or AWWA C900 (DR-18) 150 psi rated PVC in sizes to 12 inch. When the Contractor installs a pipe that crosses over a utility structure or storm sewer and the top of the utility structure or storm sewer is within 18 inches of the bottom of the pipe, the pipe shall be either ductile iron, AWWA C900 (DR-18) 150 psi rated PVC in sizes to 12 inch, unless otherwise specified by the E/A.
2. Steel casing must be used when water mains cross under box culverts, large storm drain pipes (48 inches or greater in diameter), or multiple barrel storm drains of any size. Casing sizes shall be in accordance with NBU Construction Specifications. Casing must extend 5' beyond the OD of the storm drain crossing.

3. Where trenches wider than 12 inches cross under existing wastewater lines, the sewer lines shall be replaced with one 20-foot joint of AWWA C900 (DR-18) 150 psi rated PVC or ASTM D 2241 (SDR-26) 160 PSI rated PVC centered over the trench.

C. Laying Pipe

1. All recommendations of the manufacturer shall be carefully observed during handling and installation of each material. Unless otherwise indicated, all materials shall be delivered to the project by the manufacturer or agent and unloaded as directed by the Contractor. Each piece shall be placed facing the proper direction near to where it will be installed.
2. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times and stored in a manner that will protect them from damage. Stockpiled materials shall be stacked so as to minimize entrance of foreign matter.
3. The interior of all pipeline components shall be clean, dry and unobstructed when installed.
4. Piping materials shall not be skidded or rolled against other pipe, etc. and under no circumstances shall pipe, fittings or other accessories be dropped or jolted.
5. During handling and placement, materials shall be carefully observed and inspected and any damaged, defective or unsound materials shall be marked, rejected and removed from the job site. Minor damage shall be marked and repaired in a manner satisfactory to the E/A. Joints, which have been placed, but not joined, backfilled, etc., shall be protected in a manner satisfactory to the E/A.

D. Assembling of Pipe

1. Angular spacing of all joints shall meet the manufacturer's recommendations for the pipe and accessories being used. Side outlets shall be rotated so that the operating stems of valves shall be vertical when the valves are installed. Pressure pipe shall be laid with bell ends facing the direction of pipe installation. Pipe end bells shall be placed upgrade for all wastewater lines.
2. Orientation marks, when applicable, shall be in their proper position before pipe is seated.
3. Before joining any pipe, all foreign matter, lumps, blisters, excess coal tar coating, oil or grease shall be removed from the ends of each pipe and the pipe ends shall then be wire brushed and wiped clean and dry. Pipe ends shall be kept clean until joints are made.
4. Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing or other materials shall be placed in the pipe.

E. Joints

1. O-Ring and Push-on Joints
 - i. Just before making a joint the ends of the pipe shall be clean, dry, free of any foreign matter, lump blisters, excessive coal tar coating and grease or oil and shall

be wire brushed. The gasket and the inside surface of the bell shall be lubricated with a light film of soft vegetable soap compound (Flax Soap) to facilitate telescoping the joints. The rubber gasket if not factory installed shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the groove. The spigot shall be centered in the bell, the pipe pushed home uniformly and brought into true alignment. Bedding material shall be placed and tamped against pipe to secure the joint. Care should be taken to prevent dirt or foreign matter from entering the joint space.

2. Bolted Joints

All flanged, mechanical or other bolted joints shall be joined with nuts and bolts and be coated as indicated above in Iron Pipe.

F. HDPE Service Line Joints

1. The pipe and fittings shall be joined by butt fusion or electrofusion couplings, mechanical joint (MJ) adapters, or by flange connections in accordance with manufacturer's recommendations and as required in this document. Unless otherwise shown on Drawings and except for connections to existing utilities, all joints shall be fused.
 - a. Butt Fusion: The pipe shall be joined by heat fusion of the ends. Prior to fusion the pipe shall be clean and the ends shall be cut square. Butt-fusion joining is applicable to pipes that have the same nominal outside diameter and wall thickness, within one SDR. Field site butt-fusion system operators shall be trained in the use of the high-quality butt-fusion equipment that secure and precisely align the pipe ends for the fusion process. Operators shall be trained by the pipe supplier or manufacturer of the fusing machine and be experienced in the operation of the equipment. Fusion quality shall be recorded, the recording of the information must be provided to the Owner. The Owner will review documents within 7 days and identify any fusion records that might indicate the need to replace an existing fused connection. The recorded fusion information must meet the standard requirements of ASTM F3124. All fusions failing to meet these requirements shall be removed and refused. Refer to ASTM F2620, ASTM F3124, ASTM F3183 and ASTM F3190.
 - b. Electrofusion: Electrofusion joining shall be done in accordance with the manufacturers recommended procedure and ASTM F1055, ASTM F1290, MAB-01 and MAB-02. Qualification of the fusion technician shall be demonstrated by evidence of electrofusion training within the past year on the equipment and pipe sizes to be utilized for this project. Installers shall follow the guidance shown in the previous documents to fabricate EF assemblies. The installer must remove oxidation from the pipe and maintain a clean surface on both pipe and fitting to ensure acceptable joint quality.
 - c. Mechanical:
 - i. Mechanical connection of HDPE to auxiliary equipment such as valves, pumps, and fittings shall use flanges or mechanical joint adapters and other devices in conformance with the AWWA Manual of Practice M55, Chapter 6. Mechanical connections shall be manufactured for HDPE pipe and approved by the connection manufacturer for use with polyethylene pipe. Uncontrolled tapering or hand-beveling in the field is not allowed.

- ii. Mechanical connections on pipe 3" and smaller are available to connect HDPE pipe to other HDPE pipe, or a fittings, or to a transition to another material. The use of stab fit style couplings is allowed, along with the use of metallic couplings of brass and other materials. All mechanical and compression fittings shall be recommended by the manufacturer for use with HDPE and with potable water.
- iii. Mechanical couplings that wrap around the pipe and act as saddles are made by several manufacturers specifically for HDPE pipe. All such saddles, tapping saddles, couplings and clamps shall be recommended by the manufacturer as being designed for use with HDPE pipe at the required pressure class; all mechanical couplings shall be fully restrained either by themselves or by an alternate means.
- d. Mechanical Joint/Flange: A flange assembly consists of a metal back-up flange or bolt-ring and a polyethylene flange adapter. MJ assembly consists of a MJ adaptor with gland ring, gasket and bolt kit. Both MJ adapters and flange adapters are fused onto the plain end of the pipe main. Bolting guidance for MJ connections is provided in AWWA C600 and guidance for flanges and gaskets is provided in PPI-TN38. Note that an HDPE flange adapter acts as both a flange and a gasket, and as such, no 'gasket' is required. For further information, refer to PPI TN38

G. Placing Pipe in Tunnels

Piping installed as a carrier pipe in a tunnel, encasement pipe, etc., shall have uniform alignment, grade, bearing, meet all requirements of the carrier pipe as specified, and conform to the reviewed Shop Drawings. All necessary casing spacers, joint restraints, bedding material, grout cradle or paving, bracing, blocking, etc., as stipulated by the Contract or as may be required to provide and maintain the required pipe alignment and grade, shall be provided by the Contractor at no cost except as provided by the Bid Items. This shall include casing spacers acceptable to the Owner attached to the carrier pipe in accordance with the manufacturer's recommendations. The insertion pushing forces shall not exceed the pipe manufacturer's recommendation. Carrier pipe may be pulled into place inside the encasement or tunnel using lubricants to ease pipe installation. Lubricants such as flax soap or drilling mud may be used for this purpose. Use of petroleum products such as oil or grease for this purpose shall not be permitted.

H. Temporary Pipe Plugs, Caps, Bulkheads and Trench Caps

1. Temporary plugs, caps or plywood bulkheads shall be installed to close all openings of the pipe and fittings when pipeline construction is not in progress.
2. All temporary end plugs or caps shall be secured to the pipe as provided under Item No. 507, "Bulkheads".
3. Trench caps shall be reinforced Class D concrete as indicated.

I. Corrosion Control

1. Protective Covering

Unless otherwise indicated, all flanges, nuts, bolts, threaded outlets and all other iron or steel components buried and in contact with earth or backfill shall be wrapped with 8-mil (minimum) polyethylene film meeting ANSI/AWWA C105 to provide a continuous wrap.

J. Pipe Anchorage, Support and Protection

Pressure pipeline tees, plugs, caps and shall be secured with thrust restraints. Joint restraints lengths shall be determined by the Engineer. Concrete thrust blocking may be approved on a case-by-case basis for connections to existing mains or other situations where restraint lengths cannot be achieved.

1. Concrete Thrust Blocking

- a. Concrete for use as reaction or thrust blocking shall be Class B conforming to TxDOT Item No. 421, "Hydraulic Cement Concrete".
- b. Concrete blocking shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be as indicated or directed by the E/A. The blocking shall, unless otherwise indicated, be so placed that the pipe, fittings and joints will be accessible for repair.
- c. The trench shall be excavated at least 6 inches outside the outermost projections of the pipe or appurtenance and the trench walls shaped or undercut according to the detail Drawings or as required to provide adequate space and bearing area for the concrete.
- d. The pipe and fittings shall be adequately weighted and laterally braced to prevent floating, shifting or straining of the pipeline while the concrete is being placed and taking initial set. The Contractor shall be solely responsible for the sufficiency of such restraints.

2. Metal Thrust Restraint

Fabricated thrust restraint systems such as those described below may be approved for use instead of concrete blocking. To obtain approval, the project Drawings must include sufficient drawings, notes, schedules, etc., to assure that the proposed restraints as installed will be adequate to prevent undesirable movement of the piping components. Such restraint systems may only be used where and as specifically detailed and scheduled on approved Project Drawings.

3. Thrust Harness

A metal thrust harness of tie rods, pipe clamps or lugs, turnbuckles, etc., may be approved. All carbon steel components of such systems, including nuts and washers, shall be hot-dip galvanized; all other members shall be cast ductile iron. After installation, the entire assembly shall be wrapped with 8-mil polyethylene film, overlapped and taped in place with duct tape to form a continuous protective wrap.

4. Restrained Joints

Piping or fitting systems utilizing integral mechanically restrained joints may be approved. All components of such systems shall be standard manufactured products fabricated from cast ductile iron, hot-dip galvanized steel, brass or other corrosion resistant materials and the entire assembly shall be protected with a continuous film wrap as described for (a) above.

Location, configuration and description of such products shall be specifically detailed on the Drawings. (Add-on attachments such as retainer glands, all-thread rods, etc., are not acceptable.)

K. Wastewater Connections**1. Connections to Mains 12 Inches and Smaller**

- a. All branch connections of new main lines shall be made by use of manholes.
- b. Service stubs shall be installed as indicated. Minimum grade shall be 2 percent downward to main and minimum cover shall be 4 1/2 feet at the curb. Standard plugs shall be installed in the dead end before backfilling.
- c. Where a service connection to a main 12 inches or smaller is indicated, a wye, tee or double wye shall be installed.
- d. Where a service connection to a main 15 inches or larger is indicated, a field tap may be made with the pipes installed crown to crown. The tap should be made conforming to the pipe manufacturer's recommendations with the E/A's approval.
- e. Where not otherwise indicated, (wastewater) service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

2. Connections to the Existing System

- a. Unless otherwise specified by the E/A, all connections made to existing mains shall be made at manholes with the crown of the inlet pipe installed at the same elevation as the crown of the existing pipe. Service stubs installed on the existing system shall be installed by use of tapping saddles unless otherwise approved by the E/A. Extreme care shall be exercised to prevent material from depositing in the existing pipe as the taps are being made.
- b. When connections to existing mains are made, a temporary plug approved by the E/A must be installed downstream in the manhole to prevent water and debris from entering the existing system before Final Completion. These plugs shall be removed after the castings are adjusted to finish grade or prior to Final Completion.

L. Water System Connections

1. The Contractor shall, at his expense, make all necessary connections of new piping or accessories to the existing water system. To minimize any inconvenience from outages, the Contractor shall schedule all such connections in advance and such schedule must be approved by the E/A before beginning any Work.

2. Line Stoppers

NBU will require contractors to use line stoppers to take an outage during construction if system valves are not available or existing valves do not function. Line stoppers will be required based on the following criteria.

- a. If the number of residential customers affected is greater than 20 and expected to last more than 4 hours.
- b. If any commercial customers are affected by the outage then the use of line stoppers will be determined on a case by case basis.

- c. If any critical care customers are affected by the outage then the use of line stoppers will be determined on a case by case basis.
- d. System conditions may require a line stopper and may not be known until construction commences.

3. Shutoffs

- a. New Braunfels Utilities will make all shutoffs on existing water mains. The Contractor shall be required to notify the E/A's field representative on the job at least 72 hours prior to the desired time for any shutoff. The E/A's field representative will notify any affected utility customers at least 24 hours prior to the shutoff. The Utility will make the shutoff after ensuring that all appropriate measures have been taken to protect the water system, customers and employees.
- b. New Braunfels Utilities will operate all valves to fill existing mains. Where a newly constructed main has not been placed in service and has only one connection to the public water supply, the Contractor may operate one valve to fill the main after approval has been obtained from the Utility. The operation of the valve is to be conducted under the immediate supervision of the E/A's field representative.
- c. Water for the Work shall be metered and furnished by the Contractor in accordance with of the Standard Contract Documents.

4. Wet Connections to Existing Water System

- a. The Contractor shall make all wet connections called for by the Contract or required to complete the Work. Two connections to an existing line performed during the same shutout, at the same time and at a distance less than 50 linear feet apart, will be considered one wet connection. Two connections to an existing line performed during the same shutout, at the same time and at a distance equal to, or greater than 50 linear feet will be considered two wet connections. A wet connection shall include draining and cutting into existing piping and connecting a new pipeline or other extension into the existing pressure piping, forming an addition to the water transmission and distribution network.
- b. The Contract price for wet connections shall be full payment for all necessary shutoffs, excavation, removing plugs and fittings, pumping water to drain the lines, cutting in new fittings, blocking and anchoring piping, bedding and backfilling, placing the lines and service and all site cleanup.
- c. No water containing detectable amounts of chlorine may be drained, released, or discharged until specific planning and appropriate preparations to handle, dilute and dispose of such chlorinated water are approved in advance by the Utility and the disposal operations will be witnessed by an authorized representative from the Utility.

5. Pressure Taps to Existing Water System **(Note: Pressure taps can only be performed by NBU pre-approved Contractors.)**

- a. The Contractor shall make all pressure taps called for by the Contract Documents or required to complete the Work. A pressure tap shall consist of connecting new piping to the existing water system by drilling into the existing pipe while it is carrying water under normal pressure without taking the existing piping out of service.

- b. Unless otherwise provided by the Contract, the Contractor shall, at his expense, perform all necessary excavation, furnish and install the tapping sleeve, valve and accessories, provide the tapping machine, drill the tap and shall block, anchor and backfill the piping, valve and all accessories, place the new piping in service and perform all site cleanup. When NBU makes the tap, NBU crews will tap the main and install the service to the property line. In this case, the Contractor must pay for the tap in advance at NBU's Service Center located at 355 FM 306.
- c. If a private Contractor makes the tap, a Utility Inspector must be present. "Size on size" taps will not be permitted, unless made by use of an approved full circle gasket tapping sleeve. Concrete blocking shall be placed behind and under all tap sleeves 24 hours prior to making the wet tap.

6. Service Connections

- a. Service connection taps into PVC, AC, CI, or DI pipe 16 inches or smaller shall be made using either a service clamp or saddle or a tapping sleeve as recommended by the pipe manufacturer and as approved by the E/A. Direct tapping of these pipes will not be permitted.
- b. All water service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.
- c. Precautions should be taken to ensure that the tapping saddle or sleeve is placed on the pipe straight to prevent any binding or deformation of the PVC pipe. The mounting chain or U-bolt strap must be tight.
- d. Tapping shall be performed with a sharp shell type cutter so designed that it will smoothly penetrate heavy walled PVC DR14 and 200 psi AC and will retain and extract the coupon from the pipe.

7. Cleanup and Restoration

- a. It shall be the Contractor's responsibility to keep the construction site neat, clean and orderly at all times. Cleanup shall be vigorous and continuous to minimize traffic hazards or obstructions along the streets and to driveways. Trenching, backfill, pavement repair (as necessary), and cleanup shall be coordinated as directed by the Utility. The E/A will regulate the amount of open ditch and may halt additional trenching if cleanup is not adequate to allow for orderly traffic flow and access.
- b. Materials at the site shall be stored in a neat and orderly manner so as not to obstruct pedestrian or vehicular traffic. All damaged material shall be removed from the construction site immediately and disposed of in a proper manner. All surplus excavated materials become the property of the Contractor for disposal at his expense. After trenching, the Contractor shall immediately remove all excavated materials unsuitable for or in excess of, backfill requirements. Immediately following the pipe laying Work as it progresses, the Contractor shall backfill, grade and compact all excavations as provided elsewhere and shall immediately clean up and remove all unused soil, waste and debris and restore all surfaces and improvements to a condition equal or superior to that before construction began and to an appearance which complements the surroundings. The Contractor shall grade and dress the top 6 inches of earth surfaces with soil or other material similar and equal

to the surrounding, fill and smooth any visible tracks or ruts, replace and re-establish all damaged or disturbed turf or other vegetation and otherwise make every effort to encourage the return of the entire surface and all improvements to a pleasant appearance and useful condition appropriate and complementary to the surroundings and equal or similar to that before construction began.

M. Water Main Abandonment

1. Water mains to be abandoned shall be disconnected from pipes that are to remain in service and entirely filled with pumpable grout. All connections to existing mains to remain in service shall be cut or plugged as appropriate and thrust blocks installed as necessary. All valves on the water main shall be abandoned as per the section below. Contractor is responsible for all labor, equipment, and materials required to complete the work.
2. Service lines to be abandoned shall be disconnected at the corporation stop at the main, and all other valves and appurtenances, including the water meter, shall be removed. All meters to be removed shall be returned to NBU.

N. Valve Abandonment

1. Valves to be abandoned shall only occur when an abandoned valve is left on an abandoned water main that is no longer in service. A valve to be abandoned shall have the valve box, casing, and valve stem extension (if present) removed to a minimum of 18-inches below grade. The remaining casing shall be filled with non-shrink grout to the top of the casing.

O. Wastewater Main Abandonment

1. Wastewater mains to be abandoned shall be cleaned and televised per Item No. 315 "CCTV Inspection" to verify all existing laterals have been transferred to another wastewater main.
2. Wastewater mains to be abandoned shall be disconnected from pipes or manholes that are to remain in service and entirely filled with pumpable grout. All connections to existing mains to remain in service shall be cut or plugged as appropriate. Contractor is responsible for all labor, equipment, and materials required to complete the work.
3. Wastewater manholes to be abandoned shall be abandoned per NBU Standard No. 340 "Abandoned Manhole."

510.6 Measurement

Pipe will be measured by the linear foot for the various types, sizes and classes. Parallel lines will be measured individually.

Pipe to be abandoned shall be measured by the cubic yard of pumpable grout required to completely fill the pipe.

Where a line ties into an existing system, the length of the new line will be measured from the visible end of the existing system at the completed joint. Unless otherwise indicated, the length of water and wastewater lines will be measured along pipe horizontal centerline stationing through fittings, valves, manholes, and other appurtenances.

Unless otherwise provided, ductile iron fittings 24-inch and smaller will be measured by the ton and paid for in accordance with the schedule in Standard Product List. Unless otherwise provided, fittings larger than 24-inch sizes will be subsidiary to the pipe. These will be subsidiary to the bid item Pipe.

Excavation and backfill, when included under pipe installation will not be measured as such but shall be included in the unit price bid for constructing pipe and measured as pipe complete in place including excavation and backfill.

When pay items are provided for the other components of the system, measurement will be made as addressed hereunder.

510.7 Payment

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot for the various sizes of pipe, of the materials and type indicated, unless unstable material is encountered or trench excavation and backfill is bid as a separate item.

A. Pipe

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot complete-in-place as designed and represented in the Drawings and other Contract documents. Unless otherwise provided herein, as separate pay item(s), subsidiary items to the bid price per linear foot of pipe shall include:

1. Clearing
2. Constructing any necessary embankment
3. Excavation
4. Disposal of surplus or unusable excavated material
5. Furnishing, hauling and placing pipe
6. Fittings larger than 24 inch
7. Field constructed joints, collars, temporary plugs, caps or bulkheads
8. All necessary lugs, rods or braces
9. Pipe coatings and protection
10. Connections to existing systems or structures, concrete blocking and thrust blocks and restrained joints
11. Preparing, shaping, pumping for dewatering, and shoring of trenches
12. Bedding materials
13. Backfill materials
14. Hauling, placing and preparing bedding materials
15. Particle migration measures
16. Hauling, moving, placing and compacting backfill materials
17. Temporary and permanent pavement repairs and maintenance

18. Temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction
19. Cleanup
20. Vertical stack on deep wastewater services
21. All other incidentals necessary to complete the pipe installation as indicated

B. No separate payment will be made for thrust restraint measures.

C. Wet Connections to Water Mains

When called for in the bid, wet connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work required to make the connection and place the pipe in service.

D. Fittings

Cast iron and ductile iron fittings of the class indicated, furnished in accordance with these specifications will be paid for at the unit price bid per ton, complete in place, according to scheduled weights for mechanical joint fittings furnished, including glands, bolts and gaskets, as published in the following standards:

1. AWWA C153 for all fittings 4-inch through-24 inch sizes, regardless of whether AWWA C110 or AWWA C153 fittings are furnished or the type of end connections supplied.
2. AWWA C110 for all fittings larger than 24-inch size.

E. Pressure Taps

Pressure taps will be paid for at the unit price bid, complete in place, according to the size tap made and the size main tapped and shall be full payment for furnishing all necessary materials, including tapping sleeve and valve, making the tap, testing and placing the connection in service.

F. Trench Safety Systems

When called for in Bid, Trench Safety Systems shall conform to Item No. 121, "Trench Safety Systems".

G. Water Main Abandonment

Water main abandonment shall be paid for at the unit price bid, complete in place, according to the size of the main to be abandoned, and shall be full payment for furnishing all labor, equipment, and materials necessary to fill the existing main with pumpable grout. Unless otherwise provided herein, as separate pay item(s), subsidiary items to the bid price shall include:

1. All excavation required to access the existing main
2. Installation of plugs or caps
3. Installation of thrust blocks
4. Backfill, compaction, and restoration
5. Temporary and permanent pavement repairs and maintenance
6. Disposal of surplus or unusable excavated material

7. Removal and legal disposal of existing water main
8. Temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction
9. Cleanup

H. Water Service Abandonment

Water service abandonment shall be paid for at the unit price bid, complete in place, according to the size of the service to be abandoned, and shall be full payment for furnishing all labor, equipment, and materials necessary to plug or cap the connection to the existing main and remove all existing valves and appurtenances. Unless otherwise provided herein, as separate pay item(s), subsidiary items to the bid price shall include:

1. All excavation required to access the existing main
2. Installation of plugs or caps
3. Backfill, compaction, and restoration
4. Temporary and permanent pavement repairs and maintenance
5. Disposal of surplus or unusable excavated material
6. Removal and legal disposal of existing service materials
7. Delivery of water meters to NBU storage facilities or inspection personnel, as directed
8. Temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction

I. Wastewater Line Abandonment

Wastewater line abandonment shall be paid for at the unit price bid, complete in place, according to the size of the main to be abandoned, and shall be full payment for furnishing all labor, equipment, and materials necessary fill the existing line with pumpable grout. Unless otherwise provided herein, as separate pay item(s), subsidiary items to the bid price shall include:

1. Cleaning and televising the existing main
2. All excavation required to access the existing main
3. Installation of plugs or caps
4. Installation of thrust blocks
5. Backfill, compaction, and restoration any required excavation
6. Temporary and permanent pavement repairs and maintenance
7. Removal and legal disposal of surplus or unusable excavated material
8. Removal and legal disposal of existing sewer materials
9. Temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction
10. Cleanup

Payment, when included as a Contract pay item, will be made under one of the following:

Pay Item: Pipe, __ Dia. ____ (all depths), including Excavation and Backfill	Per Linear Foot
Pay Item: Pressure Taps, ____ Dia. x ____ Dia.	Per Each
Pay Item: Wet Connections, ____ Dia. x ____ Dia.	Per Each
Pay Item: Ductile Iron Fittings 4 inch through 24 inch	Per Ton
Pay Item: Abandon and Grout Fill, ____ Dia. Water Main	Per CY
Pay Item: Abandon and Grout Fill, ____ Dia. Wastewater Main	Per CY

End

Item No. 512

Conductive Trace Wire for Non-Metallic Pipe Installation

512.1 Description

Install electrically continuous trace wire with access points as described herein to be used for locating non-metallic pipe with an electronic pipe locator after installation.

512.2 Materials**A. Trace Wire**

Trace wire for direct bury applications shall be twelve (12) gauge minimum solid copper or high-strength copper-clad steel (HS-CCS) with HDPE or HMWPE insulation recommended for direct burial.

Trace wire for trenchless applications shall be twelve (12) gauge minimum extra-high-strength copper-clad steel (EHS-CCS) with HDPE or HMWPE insulation recommended for direct burial.

Trace wire for all applications shall have insulation color per the APWA Uniform Color Code for the specific utility being marked.

B. Wire Connectors

Wire connectors must be watertight, provide electrical continuity, and be filled with dielectric moisture resistant grease. Connectors shall be 3M Direct Bury Splice Kits, Copperhead Snakebite Locking Connectors, or approved equal.

C. Access Points

Access Points shall meet the requirements of NBU SPL 18.1.0.

512.3 Construction Methods

Tracer wire shall be installed on all non-metallic water mains and force mains. The wire shall be installed in such a manner as to be able to properly trace all water mains or force mains without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

Tracer wire shall be installed in the same trench and inside bored holes and casing with non-metallic pipe during pipe installation. It shall be secured to the pipe as required to ensure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at tracer wire access points installed per NBU standard details. Sections of wire shall be spliced together using approved splice caps and waterproof seals. Twisting the wires together is not acceptable. No bare tracer wire shall be accepted. Detection tape shall not be used in lieu of tracer wire.

A. Wastewater – Force Mains

For access points along force mains, tracer wire access points shall be placed at intervals of no greater than 500 feet including one at the pump station and one at the discharge point.

B. Water

Tracer wire access points are to be placed at intervals no greater than 600' and adjacent to isolation valves or fire hydrants.

C. Pipe Application

At the point of connection between cast or ductile iron water mains, with any non-iron water main, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of 2 inches thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.

Tracer wire shall be laid flat and securely affixed to the top of the pipe at 10-foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.

The tracer wire will be allowed some slack to allow for bends in laying and for future installation of joints, splices, tapping saddles, etc. The slack should also be sufficient to allow for small earth movements occurring in compacting trench fill or through natural subsidence.

At all water main end caps, a minimum, of 6 feet of tracer wire shall be extended beyond the end of the pipe, coiled and secured for future connections. The end of the tracer wire shall be spliced to the wire of a six-pound zinc anode and is to be buried at the same elevations as the water main.

D. Boring

For directional drilling, auguring or boring installations, four #12 tracer wires shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends.

E. Splicing

Except for approved spliced-in connections, tracer wire shall be continuous and without splices from valve chamber to valve chamber.

Spliced connections between the main line tracer wire and branch connection tracer wire shall only be allowed at water main tees, crosses or at water services where a portion of the branch connection water main or water service is replaced with a non-iron or non-copper material. The branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. Where the existing branch connection is neither iron nor copper, then the new branch connection tracer wire shall be properly spliced to the existing tracer wire on the branch connection.

When tying new construction to old construction, tracer wire will not be terminated to or on another tracer wire or metallic utility line unless the two systems are demonstrably compatible. This is to reduce the potential for rapid corrosion of one system due to a 'reverse' cathodic effect.

At all repair locations where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

512.4 Testing Requirements

Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineers' representative.

- A. All tracer wire for new utility installations will be tested before acceptance. The test will take the following form:
 - 1. A standard 5-watt generator will be used to provide an AC current on the wire.
 - 2. The frequency of the signal from the generator will be initially restricted to 33 kHz or less.
 - 3. A standard handheld detector will be used to trace the signal.
- B. The installed tracer wire will be deemed to pass the test if using this set up:
 - 1. The tracer wire is accessible at all access points.
 - 2. The tracer wire can be traced from access point to access point.
 - 3. Widely spaced access points can be traced out in the worst case from each 'end' to a common meeting point between them.
 - 4. Depth readings are consistent and accurate to within 15 to 1 depth to diameter ratio.
- C. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

512.5 Measurement and Payment

There is no separate payment for the supply and installation of tracer wire on any construction or installation of non-metallic water main or force main by the Contractor. The Contractor shall consider the supply and installation of the tracer wire incidental to all construction of non-metallic water main and force main.

End

Item No. 515
Pipeline Testing and Acceptance

515.1 Description

This item shall consist of the testing and acceptance of water and wastewater pipes, including hydrostatic testing for pressure pipes, low pressure air testing for gravity pipes, deflection and settlement testing.

A. Tests shall be required in accordance with the following table:

	Bacteriological Testing	Hydrostatic Testing	Exfiltration Test	Infiltration Test	Low Pressure Air Test	Settlement Testing	Deflection Testing	CCTV Inspection
Water Mains	X	X						
PVC Gravity Sewer Mains					X	X	X	X
Other Gravity Sewer Mains			X	X		X	X	X
Force Mains		X						

515.2 Submittals

A. Furnish test reports as described below:

1. Submit written plan for disinfection.
2. Submit detailed hydrostatic test procedure 10 days prior to conducting the test.
3. Contractor shall submit his proposed pipe mandrels or testing balls to the E/A or his designated representative for concurrence prior to testing the line.
4. Submit Hydrostatic Pipe Test Reports.

515.3 Standards

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. ASTM International (ASTM):

ASTM F2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure

ASTM F1417-11A	Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Line Using Low-Pressure Air

2. American Water Works Association (AWWA):

AWWA B300	Hypochlorites
AWWA C200	Steel Water Pipe, 6 In (150 mm) and Larger
AWWA C600	Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C604	Installation of Buried Steel Water Pipe – 4 In. (100 mm) and Larger
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA C651	Disinfecting Water Mains
AWWA M9	Concrete Pressure Pipe
AWWA M11	Steel Pipe – A Guide for Design and Installation
AWWA M23	PVC Pipe – Design and Installation
AWWA M41	Ductile-Iron Pipe and Fittings
AWWA M55	PE Pipe – Design and Installation

515.4 Products

A. Water for Testing

1. Obtain water for filling and testing the pipeline and provide all temporary pumps and piping necessary to fill the pipeline.
2. If chlorinated water is used, then dechlorinate it before disposal per all regulations.
3. Water for the Work shall be metered and furnished by the Contractor in accordance with of the Standard Contract Documents.

B. Test Plugs

1. Design plugs or blind flanges to withstand the test pressure on either side with only atmospheric pressure on the opposite side.
2. Provide a 30-inch access manhole in one side of the plug and a 12-inch flanged outlet on the other side of the plug unless shown differently on the Drawings.

C. Pressure Gauge

1. Use a pressure gauge having minimum divisions of 0.10 psi and an accuracy of 0.0625 psi. (One ounce per square inch.)

D. CCTV Equipment

1. General

Equipment used shall be designed for use in gravity wastewater collection systems per Specification Item No. 315 "CCTV Inspection".

515.5 EXECUTION**A. General**

Perform tests in accordance with this Section, AWWA Standards, AWWA Manuals, and the supplier's recommendations.

B. Water Pipe Acceptance Testing

Acceptance testing for potable water pipes requires two tests, bacteriological and hydrostatic. Bacteriological testing should be done on the pipe after disinfection and prior to the hydrostatic testing, unless the pipe is isolated in the system such that there are no services or trunk line connected and approved by an NBU inspector. After the pipe has been installed and backfilled and all service laterals, fire hydrants and other appurtenances installed and connected, a hydrostatic test will be conducted by the Contractor.

1. Disinfection of Potable Water Lines**a. Preventing Contamination**

The Contractor shall protect all piping materials from contamination during storage, handling and installation. Prior to disinfection, the pipeline interior shall be clean, dry, and unobstructed. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work.

b. Cleaning

Prior to disinfection the Contractor shall clean the pipeline to remove foreign matter. For pipelines 16-inches in diameter or smaller, cleaning shall consist of flushing the pipeline. For pipelines greater than 16-inches in diameter, cleaning shall be performed by operating hydrants and blow-offs located at low points in the pipeline, or by mechanical means (sweeping or pigging).

c. Procedure and Dosage

- i. The Contractor, at its expense, will supply the test gauges and the Sodium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately five percent (5%) to fifteen percent (15%) available chlorine, and will submit for approval a written plan for the disinfection process. Calcium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately 65 percent available chlorine by weight, may be used in granular form or in 5 g tablets for 16-inch diameter or smaller lines, if it is included as part of the written plan of disinfection that is approved by New Braunfels Utilities. The Contractor, at its expense, shall provide all other equipment, supplies and the necessary labor to perform the disinfection under the general supervision of the Utility.
- ii. One connection to the existing system will be allowed with a valve arranged to prevent the strong disinfecting dosage from flowing back into the existing water supply piping. The valve shall be kept closed and locked in a valve box with the lid painted red. No other connection shall be made until the disinfection of the new line is complete and the water samples have met the established criteria. The valve shall remain closed at all times except when filling or flushing the line and must be manned during these operations. Backflow prevention in the form of a reduced pressure backflow assembly must be provided if the valve is left unattended. The new pipeline shall be filled completely with disinfecting solution by feeding the concentrated chlorine and approved water from the existing system

uniformly into the new piping in such proportions that every part of the line has a minimum concentration of 50 mg/liter available chlorine.

- iii. The disinfecting solution shall be retained in the piping for at least 24 hours and all valves, hydrants, services, stubs, etc. shall be operated so as to disinfect all their parts. After this retention period, the water shall contain no less than 25 mg/liter chlorine throughout the treated section of the pipeline.
 - iv. For pipelines larger than 16-inches in diameter, the Contractor may use the AWWA C-651 "Slug Method" for disinfecting the pipeline. Chlorine shall be fed at a constant rate and at a sufficient concentration at one end of the pipeline to develop a slug of chlorinated water having not less than 100 mg/liter of free chlorine. The Contractor shall move the slug through the main so that all interior surfaces are exposed to the slug for at least three (3) hours. The chlorine concentration in the slug shall be measured as it moves through the pipeline. If the chlorine concentration drops below 50 mg/liter, the Contractor shall stop the slug and feed additional chlorine to the head of the slug to restore the chlorine concentration to at least 100 mg/liter before proceeding. As the slug flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.
 - v. Unless otherwise indicated, all quantities specified herein refer to measurements required by the testing procedures included in the current edition of "Standard Methods for the Examination of Water and Wastewater," jointly published by AWWA, WEF, and AHPA. The chlorine concentration at each step in the disinfection procedure shall be verified by chlorine residual determinations.
- d. Final Flushing

The heavily chlorinated water shall then be carefully flushed from the potable water line until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system. Proper planning and appropriate preparations in handling, diluting, if necessary, and disposing of this strong chlorine solution is necessary to insure that there is no injury or damage to the public, the water system or the environment. The plans and preparations of the Contractor must be approved by NBU before flushing of the line may begin. Additionally, the flushing must be witnessed by an authorized representative of NBU.

Approval for discharge of the diluted chlorine water or heavily chlorinated water into the wastewater system must be obtained from New Braunfels Utilities. The line flushing operations shall be regulated by the Contractor so as not to overload the wastewater system or cause damage to the odor feed systems at the lift stations. The Utility shall designate its own representative to oversee the work. Daily notice of line discharging must be reported to New Braunfels Utilities Dispatch office.

2. Bacteriological Testing

After final flushing of the disinfecting solution, the system will be tested for bacteriological quality by the Utility and must be found free of coliform organisms before the pipeline may be placed in service. All stubs shall be tested before connections are made to existing systems.

- a. Contractor must collect two (2) sets of water samples taken at least twenty-four (24) hours apart. Each set shall consist of one (1) sample that is drawn from the end of the

main and additional samples that are collected at intervals of not more than 1000 feet along the pipeline.

- b. The Contractor, at its expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.
- c. Samples for bacteriological analysis will only be collected from suitable sampling taps in sterile bottles treated with sodium thiosulfate. Samples shall not be drawn from hoses or unregulated sources. The Utility, at its expense, will furnish the sterile sample bottles and may, at its discretion, collect the test samples with Utility personnel.
- d. If the initial disinfection fails to produce acceptable sample test results, the disinfection procedure shall be repeated at the Contractor's expense. Before the piping may be placed in service, two (2) consecutive sets of acceptable test results must be obtained.
- e. An acceptable test sample is one in which: (1) the chlorine level is similar to the level of the existing distribution system; (2) there is no free chlorine and (3) total coliform organisms are absent. An invalid sample is one, which has excessive free chlorine, silt or non-coliform growth as defined in the current issue of the "Standards Methods for the Examination of Water and Wastewater." If unacceptable sample results are obtained for any pipe, the Contractor may, with the concurrence of the Inspector, for one time only flush the lines and then collects a second series of test samples for testing by the Utility. After this flushing sequence is completed, any pipe with one or more failed samples must be disinfected again in accordance with the approved disinfection procedure followed by appropriate sampling and testing of the water.
- f. New Braunfels Utilities Water Quality Laboratory will notify the assigned Utility Inspector in writing of all test results. The Inspector will subsequently notify the Contractor of all test results. The Water Quality Laboratory will not release test results directly to the Contractor.

3. Hydrostatic Test

- a. The Contractor will furnish the pump and gauges for the tests. The Utilities Representative shall be present during the tests. The specified test pressures will be based on the elevation of the lowest point of the line or section under test. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points.
- b. Determine the HGL for each test section, and test such that the pressure range below is achieved (lower pressure at high point and higher pressure at low point).
 - i. Test pressure shall in no case be less than 200 psi, or more than 2X the working pressure.
- c. All drain hydrant and fire hydrant leads, with the main 6-inch gate valve open, the hydrant valve seats closed and nozzle caps open, shall be included in the test.
- d. Prior to pressure testing against an existing system valve, a bacteriological test shall be performed to determine potability of water.
- e. A hydrostatic test will be conducted on the entire project or each valved section to test for leakage. The leakage test shall be at 150 psi for at least 4 hours.

i. Allowable Leakage

Leakage shall be defined as the quantity of water that must be supplied into any test section of pipe to maintain the specified leakage test pressure (see above, "Pressure Pipe Leakage Test") after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if the leakage exceeds 25 gallons/24 hours/mile of pipe/inch nominal pipe diameter.

$$\frac{(25 \text{ gpd})}{(\text{in.} \cdot \text{mi.})}$$

ii. Location and Correction of Leakage

If such testing discloses leakage in excess of this specified allowable, the Contractor, at his expense, shall locate and correct all defects in the pipeline until the leakage is within the indicated allowance.

All visible leakage in pipe shall also be corrected by Contractor at his own expense.

C. Wastewater Pipe Acceptance Testing

Gravity sewer pipe installed in the New Braunfels Utility System shall be tested for exfiltration or infiltration as described below in "Exfiltration Test" and "Infiltration Test" or by acceptable low pressure air test, as described below. At the conclusion of either test series, the Work shall be further tested for pipeline settlement and also for deflection as described below. Finally, the pipe shall be inspected with closed circuit television (CCTV) camera per Specification Item No. 315 "CCTV Inspection".

Force main sewer pipe shall be tested in accordance with the hydrostatic test procedure outlined in the "Water Pipe Acceptance Testing."

The Contractor shall be solely responsible for making proper repairs to those elements which do not pass these test requirements.

1. Wastewater Exfiltration Test

- a. The pipeline shall be completely filled with water for its complete length or by sections as determined by the E/A. If tested for its complete length, the maximum head at any point shall not exceed 25 feet unless otherwise indicated. If tested in sections, the manholes in the test section shall be completely filled with water. After the pipeline has been filled and allowed to stand for 24 hours, the amount of exfiltration shall be calculated. Any amount in excess of 200 gallons per inch of inside pipe diameter per mile per day shall be cause for rejection.
- b. For portions of lines located within the Edwards Aquifer Recharge Zone or within any recharge area or recharge feature within the Edwards Aquifer Transition Zone, the minimum head during testing shall not be less than 2 feet and the leakage rate shall not exceed 50 gallons per inch of inside pipe diameter per mile per day. This rate shall apply for the entire portion of the line extending up to the first manhole located outside the recharge zone, recharge area, or recharge features indicated on Drawings and shall also be applicable for any recharge areas or recharge features which may be identified during construction. For construction within the 25-year flood plain, the exfiltration rate shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head.

2. Wastewater Infiltration Test

- a. When the pipe placed in easements is completed, the upper portion of the trench backfill shall be removed to a depth of not less than 18 inches below the finished surface and width equal to the original trench width. The trench shall then be flooded with water until it is completely saturated and water stands in the ditch a minimum of 12 inches deep. In cases of steep terrain, earthen dikes shall be used to assure that water will stand over the trench. After it is apparent that the trench is completely saturated, the main shall then be inspected with closed-circuit television for infiltration. Any section of the main or any service stub that indicates infiltration above the maximum quantity specified shall be cause for rejection.
- b. This procedure shall not be used for pipes installed in areas where the Plasticity Index (P.I.) of the surrounding material is 20 or higher or where the backfill material has a P.I. of 20 or more.
- c. For portions of lines located within the Edwards Aquifer Recharge Zone or within any recharge area or recharge feature within the Edwards Aquifer Transition Zone, the total infiltration as determined by water test, must be at a rate not greater than 50 gallons per inch of pipe diameter per mile of pipe per 24 hours at a minimum test head of two feet. This rate shall apply for the entire portion of the line extending up to the first manhole located outside the recharge zone, recharge area, or recharge features indicated on Drawings and shall also be applicable for any recharge areas or recharge features which may be identified during construction. For construction within the 25-year flood plain, the infiltration rate shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head.
- d. If the quantity of infiltration exceeds the maximum quantity specified, remedial action must be undertaken to reduce the infiltration to an amount within the limits specified.

3. Low Pressure Air Test of Plastic Gravity Flow Wastewater Lines

Wastewater lines, at the discretion of the E/A, shall be air tested between manholes. Backfilling to grade shall be completed before the test and all laterals and stubs shall be capped or plugged by the Contractor so as not to allow air losses, which could cause an erroneous, test result. Manholes shall be plugged so they are isolated from the pipe and cannot be included in the test. Use only qualified personnel to conduct the test.

a. Plugs

All plugs used to close the sewer for the air test shall be capable of resisting the internal pressures and must be securely braced. Place all air testing equipment above ground and allow no one to enter a manhole or trench where a plugged sewer is under pressure. Release all pressure before the plugs are removed.

b. Pressure Relief Device

The testing equipment used must include a pressure relief device designed to relieve pressure in the sewer under test at 10 psi or less and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. Use care to avoid the flooding of the air inlet by infiltrated ground water. (Inject the air at the upper plug if possible.)

c. Ground Water

Since the presence of ground water will affect the test results, test holes shall be dug to the pipe zone at intervals of not more than 100 feet and the average height of ground water above the pipe (if any) shall be determined before starting the test.

d. Test Procedure

- i. The E/A may, at any time, require a calibration check of the instrumentation used. All air used shall pass through a single control panel. Clean the sewer to be tested and remove all debris where indicated. Wet the sewer prior to testing. The average back pressure of any groundwater shall be determined (0.433 psi) for each foot of average water depth (if any) above the sewer.
- ii. Add air slowly to the section of sewer being tested until the internal air pressure is raised to 4.0 psig greater than the average back pressure of any ground water that may submerge the pipe. After the internal test pressure is reached, allow at least 2 minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure. After the temperature stabilization period, disconnect the air supply. Determine and record the time in seconds that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average backpressure of any ground water that may submerge the pipe. Compare the time recorded with the specification time for the size and length of pipe as given in the following table:

Table for Low Pressure Air Testing of Plastic Pipe:

Minimum Specified Time Required For 1.0 psig Pressure Drop For Size and Length of Pipe Indicated								
Diameter of Pipe, (in.)	Specification Time (min: sec) for length shown							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

NOTES: 1. Specification times are as given in UNI-B-6 RECOMMENDED PRACTICE FOR LOW-PRESSURE TESTING OF INSTALLED PIPE -- by Uni-Bell PVC Pipe Association, 2655 Villa Creek Dr., Ste. 155, Dallas Texas 75234.

- iii. Any drop in pressure, from 3.5 psig to 2.5 psig (adjusted for groundwater level), in a time less than that required by the above table shall be cause for rejection. When the line tested includes more than one size pipe, the minimum time shall be that given for the largest size pipe included.
- e. Edwards Aquifer Recharge/Transition Zone Test Procedure
 - i. Low-pressure air tests must conform to the procedure described in ASTM F1417-11A or other equivalent procedures. For safety reasons, air testing of pipe sections will be limited to line sizes of 36 inches inside diameter or less. Lines that are 36 inches or larger inside diameter must be air tested at each joint.
 - ii. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch to 2.5 pounds per square inch gauge during a joint test, regardless of pipe size, shall be twenty (20) seconds.
 - iii. For sections of pipe less than 36-inch inside diameter, 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 must be computed by the following equation:

$$T = 0.0850 (D)(K)/(Q), \text{ where}$$

T = time for pressure to drop 1.0 pounds per square inch gauge in seconds;

K = $0.000419(D)(L)$, but not less than 1.0

D = nominal inside diameter in inches;

L = length of line of same pipe size in feet; and

Q = rate of loss, assume 0.0015 cubic feet per minute per square foot ($\text{ft}^3/\text{min}/\text{ft sq}$) of internal surface area.

- iv. Any drop in pressure, from 3.5 psig to 2.5 psig, in a time less than that required by the above formula shall be cause for rejection. When the line tested includes more than one size of pipe, the minimum time shall be that calculated for the largest size pipe included.
- f. Manholes
 - i. Manholes must be tested separately and independently in accordance with Standard Specification Item No. 304, "Manholes".

D. Settlement Testing

During the infiltration test or after the exfiltration test, the pipe will be TV inspected for possible settlement. When air testing has been used, water shall be flushed into the pipe to permit meaningful observations. Prior to flushing, the manholes and pipes should be cleared of all debris. Any pipe settlement which causes excessive ponding of water in the pipe shall be cause for rejection. Excessive ponding shall be defined as a golf ball (1-5/8" dia.) submerged at any point along the line.

E. Deflection Testing

Deflection tests shall be performed by the Contractor on all flexible and semi-rigid wastewater pipes. The tests shall be conducted after the final backfill has been in place at least 30 days.

Testing for in-place deflection shall be with a pipe mandrel or rigid ball sized at 95% of the inside diameter of the pipe. A second test of flexible and semi-rigid wastewater pipes 18 inch size and larger, also with a pipe mandrel or ball sized at 95% of the inside diameter of the pipe, shall be conducted by the Contractor 30 days prior to expiration of his warranty on the Work.

1. Test(s) must be performed without mechanical pulling devices and must be witnessed by the E/A or his designated representative.
2. Any deficiencies noted shall be corrected by the Contractor and the test(s) shall be redone.

F. Closed Circuit Television (CCTV) Inspection

1. CCTV Televising / Inspection shall be in accordance with Specification Item No. 315 "CCTV Inspection".

510.5 Measurement and Payment

No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this Item but shall be considered subsidiary to the particular items required by the bid.

End

**Item No. 517
Submersible Pumps****517.1 Description**

- A. This item shall govern furnishing labor, materials, equipment and incidentals necessary to install 2 new submersible sewage pumps, valves, check valves, vault, pressure gauge assemblies, 1 jib crane with foundation and manual hoist, air release valve, piping, access hatches, ventilators and vents as indicated on the plans, and new control panel(s). Coordinate wet well access doors with the slide rails. Test equipment in accordance with Paragraph 517.2.D and 517.19.D of this Section.
- B. The pump supplier shall furnish discharge elbows, pump impellers, guiderails, brackets, anchor bolts and anchor bolt layouts and bases, lifting chains and grip eye systems, power cables, and trash basket hoists and stands as indicated on the plans.
- C. Provide safety grate at each of the access doors to the wet well at the lift station. Verify actual size of the access doors. Installation of the safety grate shall be in accordance with the manufacturer's recommendations and the manufacturer shall provide an Equipment Installation Report certifying that it was installed properly. The manufacturer shall furnish brackets, anchor bolts and anchor bolt layouts and appurtenances required for the installation of the safety grate.

517.2 Quality Assurance

- A. Acceptable Manufacturers:
 - 1. Flygt
 - 2. Gorman Rupp
 - 3. KSB
 - 4. No substitutions are allowed
- B. Manufacturer's Representative for Startup and Testing: The services of the Manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's operating personnel, troubleshooting and other services.
- C. The pump supplier shall also provide all of the maintenance required for the first year of operation including the following as a minimum:
 - 1. After 60 days operation, run each pump and record voltage and amperage, pull each pump, open the volute and examine the condition of the volute, impeller, and wear rings. Check condition of oil in seal chambers and condition of coating system on motor housing. Perform any necessary repair under terms of the warranty. Prepare a field service report.
 - 2. After 12 months operation, repeat procedure described above for 60 days. Change oil in the seal chambers.
- D. Testing:
 - 1. Each pump and motor shall be performance tested at the factory. All pumps shall be tested with motor cables to be supplied with the pumps. Three copies of certified test reports, including actual test records, shall be submitted and approved by the Engineer prior to shipment of the equipment.
 - 2. Each pump shall be tested for performance at the factory to determine the head vs. capacity, and motor input power for the full speed at which the pumps are specified and shown on a certified performance test curve as continuous

functions throughout the pump's performance range. Tests of models, prototypes or similar units will not be acceptable. All tests shall be run in accordance with the test code for centrifugal pumps of the Standards of Hydraulic Institute, latest edition. The motor and cable on each pump shall be tested for moisture content or insulation defects. After the test, the pump cable end shall be fitted with a shrink-fit rubber boot to protect it from moisture or water.

517.3 Submittals

The submittal requirements of this specification item must include:

A. Shop Drawings:

1. Shop drawings shall include a complete description of the equipment offered including control and mounting system. Shop drawings shall include catalog cuts and pertinent engineering data required to fully evaluate the equipment. Characteristic curves shall be submitted with the shop drawings showing the capacity, head, efficiency, and brake horsepower throughout the full operating range of the pump. Complete specifications on the control equipment including a list of optional features shall be submitted with the shop drawings. Submittal data shall be in such form and so presented that the Engineer may readily review the data.
2. The Equipment Manufacturer shall submit with the shop drawings a list of 20 similar installations in Texas which have been in satisfactory operation for at least two years. Shop drawings not including this required information will not be accepted. Also, the manufacturer must furnish evidence of having an authorized fully staffed and stocked service facility within 300-mile radius of the jobsite as well as having 24-hour parts availability.
3. Data sheets supplying the following information for the pumping units shall be submitted with the shop drawings.

i. Pump:

Make and type of pump	
Speed	___ rpm
Horsepower at rated head	___ HP

ii. Pump:

Total weight (pump and motor)	___ lb.
Rated capacity and head on pump curve	

iii. Motor:

Make and type of motor	
Brake horsepower of motor	___ HP
Locked Rotor Current at full nameplate voltage	___ amps
Motor Voltage Phase	___ phase
Motor service factor	
Insulation class and temperature rise at service factor load	

4. Shop drawings shall be supplied to insure successful installation and operation of the control system and shall consist of all of the following:
 - i. Sufficient detail to evaluate compliance with these specifications.
 - ii. A detailed component list including manufacturer and catalog number.
 - iii. A custom wiring diagram for this specific application to facilitate and insure accurate field connections to the control panel by electrical installation personnel.
 - iv. A description of operation for the control system.
 - v. An enclosure dimension print.
5. Motor Manufacturer shall supply documentation for the motors as follows:
 - i. Rated full load horsepower, Rated volts, Number of phases, Frequency in hertz, Full load amperes (FLA), Locked rotor amperes (LRA) at rated voltage and Locked rotor KVA/HP. Synchronous speed (srpm), service factor, Efficiency at full load, Power factor at full load.
6. Data sheets for level instrumentation and pump monitor, clearly indicating model and options being provided.
7. Supply documentation for the pump control panel as follows:
 - i. Documentation that the panel assembly facility is a UL-508 certified panel shop.
 - ii. Facsimile of the UL Label that is to be applied to the completed panel.
 - iii. Furnish complete Bill of Materials indicating manufacturer's name and part numbers.
 - iv. Manufacturer's cut sheets for every component used in the panel assembly adequately marked to show the items being included. The manufacturer's name shall be clearly visible on each cut sheet submitted.
 - v. Assembly ratings including: Short-circuit rating, Voltage, Continuous current
 - vi. Major Component ratings including: Voltage, Continuous current, Interrupting ratings
 - vii. Drawings shall show the following:
 1. Nameplate legends,
 2. Short circuit rating of integrated unit.
 3. Features, characteristics, ratings and factory settings of individual overcurrent protective devices.
 4. Project specific wiring diagram /control schematics: For power, signal, and control wiring with labels on the control schematic for control relays, timing relays, level instruments, indication lights, etc.
 5. Schematic included in the plans. Include a label above each timing relays indicating the range and set points for that timing relay.

6. Project specific layout of front of panel clearly identifying the location of all panel mounted devices, and clearly indicating the maximum mounting height of devices on doors.
7. Project specific layout of inside panel (with doors off) clearly identifying all devices and power equipment.
8. Terminal strip layout clearly showing all field connections. The terminal strip layout shall also include a label next to each connection indicating signal description.
9. Conduit entry and exit locations. Conduit entry and exit points clearly showing dimensions of entry and exit points. Provide a detailed view showing how conduit penetrate the bottom/side of panel.
10. Installation weights.
11. Cable terminal sizes.
12. Internal component layout diagrams showing the front view of inside the panel (with the doors off) clearly identifying all devices and power equipment.

B. Operation and Maintenance Manuals:

1. Manuals shall be prepared by the equipment Manufacturer and shall incorporate storage and installation instructions and operation and maintenance procedures, appropriate final certified shop drawings, performance curves, and test data. Manuals may be Manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. Submit preliminary manuals for review prior to delivery of the equipment.

C. Certified Test Reports

1. Submit certified test reports for factory performance tests.

517.4 Design Conditions

- A. The pumps shall be designed to handle raw unscreened sewage on a continuous duty basis and shall be capable of passing a 3-inch non-compressible sphere. Pumps shall be guaranteed free from excessive cavitation and/or vibration throughout the system performance range. The pumps shall meet the operating conditions as specified and shall be designed to operate on a continuous duty basis. Design conditions for the pumps at each lift station shall be as specified. Also see attached system head curves for initial and future conditions.
- B. The presence of abrasives, rags, large solids and stringy materials shall not be considered as abnormal, unanticipated or abusive with regard to the equipment operation or warranty.

517.5 Delivery and Storage

- A. The Vendor shall be responsible for delivery of the pump, motor, and accessories, f.o.b. to the job site or to such storage site as may be designated by the OWNER or Construction CONTRACTOR, in good condition and undamaged.
- B. Unloading and storage of the equipment shall be the responsibility of the Construction CONTRACTOR who shall inspect the equipment for apparent damage. Equipment which is found to be damaged shall not be accepted until properly repaired or replaced by the Vendor.
- C. The pumps, motors, and accessories shall be stored indoors. When this equipment is stored indoors, it shall never be in direct sunlight and the indoor temperature shall be maintained at a level satisfactory to the OWNER. The CONTRACTOR is responsible for providing the indoor storage facility or enclosure.

517.6 Warranty

- A. Guarantee: The equipment supplier shall furnish a warranty for all equipment provided by the equipment supplier for a period of 2 years from date of Owner's final inspection and acceptance but not longer than 36 months from date of equipment delivery. All equipment shall be guaranteed against defects in material and workmanship to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

517.7 Submersible Sewage Pump

- A. Each pump, motor, and cable assembly shall be furnished in one integral unit, factory assembled by the Pump Manufacturer. Pump shall be listed as explosion proof by Underwriter Laboratories (U.L.) or by C.S.A.
- B. The pump design shall be such that the pumping unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The discharge connection shall be permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. The guide mechanism shall be a non-sparking design and U.L. or C.S.A. listed. Connection and disconnection of the pumping unit from the discharge piping shall not require personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit.
- C. The pump assembly shall also be capable of running dry or partially submerged for extended periods without any damage to the pump, motor, seals, or accessories.
- D. Major parts, such as the stator casing, oil casing, sliding bracket, volute, impeller, and base coupling shall be constructed of cast iron or bronze. Surfaces coming into contact with the pumped liquid shall be protected by a factory-applied epoxy coating or shall be stainless steel. External bolts, nuts, and fastening hardware shall be a minimum 300 series stainless steel.
- E. The pump shall be Flygt NP 3152 SH3~ 275 or engineer pre-approved equal from approved manufacturers in accordance with Paragraph 517.2.A of this Section.

517.8 Pump Construction

- A. Pump Volute: The pump volute shall be constructed of cast iron. A wear ring shall be provided in the volute which is constructed of 304 stainless steel with a minimum Brinell hardness of 300. [For pumps smaller than 40 HP, stainless steel wear plate shall be acceptable in place of wear rings.]
- B. Impeller: The impeller shall be constructed of cast iron, ductile iron or bronze and shall be of the enclosed, non-clogging, dynamically balanced, one-, two- or three-vane design capable of passing 3-inch diameter spherical solids. The impeller shall have a slip fit onto the motor shaft and drive key and shall be fastened using the manufacturer's standard technique. The impeller wear ring shall be 304 stainless steel, with a minimum Brinell hardness of 200. [For pumps smaller than 40 HP, a two-vane semi-open impeller is acceptable.]
- C. Shaft: The pump shaft shall be series 421 stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one piece construction without joints or stubs attached. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. Shaft overhang shall not exceed 2.5 times the shaft diameter.
- D. Mechanical Seals: Each pump shall be equipped with a double mechanical seal of the cartridge type or a balanced tandem-type design, running in an oil reservoir. The upper and lower faces of the rotating portion of the seal shall be made of tungsten carbide or a high quality silicon carbide. The two faces shall be held in contact by multiple springs or bellows to insure uniform face following of the rotating faces against the stationary faces. The entire seal shall be mounted within the oil chamber. The lower stationary seal face shall be made of tungsten carbide or a high quality silicon carbide. The seals shall require neither routine maintenance, nor adjustment, and shall not be damaged when the pump is run dry. When required, seal oil inspection shall be achieved without disassembly of the pump. The seal shall not require the pumped liquid as a lubricant. All metal parts shall be 316 stainless steel.
- E. O-Rings and Fasteners: All mating surfaces of the pump and motor shall be machined and fitted with Viton or Buna-N O-rings where watertight sealing is required. Sealing shall be accomplished by the proper fitting of the parts and not be compression or special torque requirements. All external screws and fasteners shall be made of 316 stainless steel.
- F. Bearings: The impeller and motor shaft for each pump shall be suspended on two permanently lubricated ball bearings that are designed by the manufacturer for minimum 50,000-hour AFBMA B10 bearing life under the design conditions.

517.9 Motor and Cable

- A. The motor shall be housed in either an air or oil filled chamber, watertight enclosure. The motor shall conform to NEMA design Class B, and incorporate minimum Class F insulation material to withstand a continuous operating temperature of 155 C (311 F). The pump and motor shall be capable of handling liquids with a maximum temperature of 40 C (104 F). The motor shall be capable of sustaining up to 10 evenly spaced starts per hour. The motor shall be capable of operating in dry or partially submerged conditions for extended periods without damage. If the motor is expected to be exposed for longer than 15 minutes, furnish air filled motors with a water jacket if required. The nameplate motor service factor shall be at least 1.15. The motor shaft shall be 400 series stainless steel. The motors shall be 460 volt, 3 phase, 60-cycle.

Lead wires shall be suitable for operation in oil. The motor shall be provided with motor thermal switches embedded in the windings to protect the motor from burnout due to excessive heating. Inrush on starting shall be no more than allowed by NEC Code Letter F for motors 50 HP and larger, and no more than allowed by NEC Code Letter G for motors less than 50 HP. Each motor shall be suitable for use in a NEC Class 1, Division 1, Group D location and be U.L. or C.S.A. listed.

- B. A separate junction chamber shall be provided inside the pump for connection of power cables to stator leads. The chamber shall be sealed by a nonmetallic terminal board bolted to a machined surfaced and utilizing an O-ring to obtain a watertight seal. Each pump shall be equipped with adequate cable to be routed from the motor termination junction box to the junction box located above the wet well. The power cable shall be sized according to NEC and ICEA standards and also meet P122-MSHA approval and this classification shall be embossed on the cable.
- C. The junction chamber, containing the terminal board, shall be sealed from the motor by elastomer compression seals (O-ring). Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board each with an individual o-ring to prevent liquid passage.
- D. Each unit shall be provided with an adequately designed cooling system. Provision for external cooling and flushing shall also be provided, if the cooling system consists of a water jacket. Each unit shall have motor seal failure sensor(s).
- E. The motor, cable, and electrical controls shall be sized, furnished, and installed so that the motor shall never exceed the nameplate rating at any point on the pumping curve.
- F. Provide stainless steel cable strain relief on each cable at wet well roof slabs.

517.10 Discharge Elbow and Guiderail Base

- A. A discharge elbow and guiderail base shall be provided for each pump and shall be permanently installed in the wet well. Stainless steel anchor bolts embedded concrete in accordance with pump manufacturer's layout and recommendations shall secure these connections.

517.11 Guiderail and Lifting Chain

- A. The guiderails and lifting chain positive recovery system shall be sized by the pump supplier. Guiderails and lifting chains shall be constructed of stainless steel. Intermediate and upper guiderail brackets shall be provided by the pump supplier to achieve the arrangement shown on the Plans.
- B. The slide rails shall be continuous stainless steel designed to resist corrosion in sewage or sludge applications. Any joints in the rails shall be reinforced from within if pipe is used; continuously full-depth welded, ground smooth, and treated to resist corrosion. If pipe is used, it shall be minimum Schedule 40. The rail system shall be of adequate length to extend from the lower guide holders on the pump discharge connection to 6 inches below the top of the wet well. The system shall be mounted with stainless steel hardware.
- C. The rail support system shall be furnished by the Pump Manufacturer, to adequately support the guide (slide) rails. Intermediate guide rail supports shall be used every 12 to 15 feet or as recommended by the pump manufacturer. The system shall be

mounted with stainless steel hardware.

- D. Each pump shall be fitted with a stainless steel chain or cable of adequate strength and length to permit raising and lowering the pump for inspection or removal. The chain or cable shall be long enough to extend from the pump in its operating position to 4 inches above the top of the wet well. Furnish and install a stainless steel hook at the top of the wet well to hold the chain when the pump is in service.
- E. Each pump shall be fitted with 3 feet of stainless steel chain of adequate strength to permit raising and lowering of the pump, and an adequate length of 1/4-inch diameter nylon rope or 18-inch stainless steel rope. The pump supplier shall provide a grip eye, which when lowered into position over the nylon rope, will automatically attach to the chain for lifting and automatically release the chain after lowering the pump back into position. The grip eye, pump chain, and associated hardware shall have a minimum capacity of 1-1/2 times the pump weight.

517.12 Sliding Coupling System

- A. A sliding guide bracket shall be an integral part of the pumping unit or securely attached thereto. The guide bracket shall be designed such that no strain is placed on the pump or guide rails. The volute casing shall have a machined discharge flange to automatically and firmly connect with the discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices. Discharge base elbow and base plate shall be supplied by the Pump Manufacturer.
- B. The pump sliding coupling system shall be designed so that the downward force of the machined mating flanges shall shear away rags, hair, or other debris that would prevent a uniform watertight seal. No portion of the pump unit shall bear directly on the floor of the wet well. The pump body and slide coupling mating faces shall be bronze against cast iron.

517.13 Hoist

- A. The hoist(s) shall be positioned for the removal of the submersible sewage pumps. Hoists shall be permanently mounted to prevent removal. Hoist shall be capable of 1500-lb. safe load with a reach of 10'-0" inches and a lift of 32'-0" feet. Hoist shall be manual.

517.14 Access Door Hatchways

- A. The access door hatchway shall be provided by the Contractor and shall be as specified in Item 523 "Floor Access Doors." The pump manufacturer shall verify that the proposed pumps will fit through the door opening and that the location of the doors will allow easy removal of each pump. The Contractor shall provide the size doors specified if adequate or the size required if a larger size is required to remove the pumps from the wet well. The access cover shall be provided with open assist-slow closure device and hold open device. Provide hasp and staple or other means for locking.

517.15 Safety Gate

- A. The safety grate shall be designed to withstand a minimum live load of 300 pounds per square foot using 17,300 psi as the design stress for the aluminum. Deflection shall not exceed 1/150th of the span. Each safety grate shall be designed to combine covering of the opening, fall through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.
- B. Safety grate shall be as manufactured for Halliday, USB Fab, Flygt Corporation or approved equal.
- C. The safety grate shall be made of 6061-T6 aluminum and designed per the "Specifications for Aluminum Structures", by the Aluminum Association, Inc., 5th Edition, Dec. 1986 for "Bridge Type Structures." This specification requires the manufacturer to use 38,000 psi as the ultimate strength and 35,000 psi as the minimum yield strength, for grade 6061-T6 aluminum and then a safety factor of 2.2 be applied, leaving a 17,300 psi design stress.
- D. Grate openings shall allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.
- E. Grating design shall provide an opening for the pump power cable once the pump is pulled. This design allows the safety grate(s) to be closed after the pump is pulled, while leaving a space for the power cable.
- F. Design must assure that the fall through protection is in place before the doors can be closed.
- G. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90 degree position once opened.
- H. Each grate shall have an opening arm, which will allow opening of the grate, while providing the grate as a barrier between the operator and the pit. The opening arm shall also be equipped with a controlled confined space entry lock (lock provided by Owner). This locking device will prevent unauthorized entry to the confined space. The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.
- I. Each aluminum safety grate shall be coated with a safety orange color, promoting visual awareness of the hazard. Powder coat system shall be applied by the electrostatic spray process. The coating is a thermosetting, powder coat finish with a minimum thickness of 2 to 4 mils and shall be baked at 350 to 375 F, or as recommended by the manufacturer, until cured.
- J. Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.
- K. All mounting hardware, bolts, nuts, etc. shall be 316 stainless steel.

517.16 (NOT USED)**517.17 (NOT USED)****517.18 Construction Methods**

- A. Installation
 - 1. Installation shall be in accordance with the Manufacturer's instructions. Any modification to the structure as a result of requiring different size access door

hatchways is the responsibility of the Contractor.

B. Field Quality Control

1. Upon completion of installation of the equipment, an acceptance test to verify the satisfactory operation of each unit shall be conducted. The Contractor shall provide the services of authorized representative to conduct all field tests. The test shall be conducted in a manner approved by and in the presence of the Engineer. The unit shall be checked for excessive noise, vibration, alignment, general operation, ease of removal, etc. All automatic and manual controls shall be tested to verify that they function in accordance with the requirements. Verify that drive equipment operates without being overloaded. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.

C. Painting

1. Pumps, motors, baseplates, discharge elbows, and guiderails shall be painted in accordance with Item No. 530 "High-Performance Coatings" of these Specifications.

D. Schedules:

	Location No.1
Location	Veramendi Lift Station
Equipment No.	1, 2
Number of Units	2
Rated Capacity (gpm)	378
Rated Head, TDH (ft.)	111.5
Minimum Capacity (gpm)*	600
Min. Cap. Rated Head, TDH (ft.)	70
Minimum Shutoff Head (ft.)	200
Maximum Speed (rpm)	3510
Minimum Pump Speed (rpm)	1755
Minimum Motor HP	15
Maximum Motor HP	25
Minimum Pump Efficiency	60
Minimum Overall Efficiency (pump and motor)	55
Normal Operating Head Range (ft.)	110
Minimum diameter of test sphere (in.)	3
Maximum NPSHR at duty (ft.)	20
Motor Voltage and phase (1 or 3-phase)	460V 3-Phase
Maximum Full Load Ampacity (A)	X
Maximum Locked Rotor Ampacity (A)	X
Maximum Motor pole number	X
Minimum Rated (FL) Power Factor (%)	X

Minimum pump discharge size (in.)	3

517.19 Measurement

All types of Submersible Pumps will be measured per each.

517.20 Payment

- A. Pump Vendor shall submit Applications for Payment filled out and signed by Vendor and accompanied by such supporting documentation as required by the Procurement Documents and also as the Owner's representative may reasonably require. The first Application for Payment will be submitted to the Owner after review and acceptance by Owner's representative of all Shop Drawings, Product Data, and Samples required by the Procurement Documents. The Application for Payment will be limited to 5 percent of the total contract amount.

Milestone	Cumulative % of Contract Price
Approval of Shop Drawings & Product Data	5%
Delivery of pre-installation materials to the Project Site ([barrels,] [sole plates,] anchor bolts)	[10%] [Invoice value as materials on hand]
Approval of factory performance tests (pump and motor), Delivery of equipment to job site in good condition and approved Preliminary Operation and Maintenance Manuals	80%
Installation, Testing, Completion of Installation reports, submittal of final Operation and Maintenance Manuals, Completion of special services	95%
Final acceptance of the installed and tested equipment, approved Final Operation and Maintenance Manuals, completed Owner personnel training and other required information	100%

- B. The next Application for Payment will be submitted after review and acceptance of the preliminary operation and maintenance manuals by the Engineer, satisfactory completion of all factory tests, and after delivery of the Goods has been accepted by the Buyer, and will be accompanied by a bill of sale, a Certification of Acceptable Delivery, Unloading, and Storage signed by the Contractor and other documentation satisfactory to the Buyer warranting that the Goods are delivered free and clear of all liens, charges, security interests, and encumbrances. Such documentation shall include releases and waivers from all parties who, during Vendor's performance under the Procurement Documents, might have obtained or filed any such lien, charge, security, or encumbrance. The Application for Payment will be limited to 80percent cumulative of the total contract amount. Portions of this amount may be paid in monthly pay estimates following partial deliveries proportionate to the amount of Goods delivered provided an itemized Schedule of Values has been submitted and approved.
- C. The next Application for Payment will be submitted after completion of equipment installation, testing, completion of the specified Installation Report, submittal of the final operation and maintenance manuals, and completion of Special Services. The Application for Payment will be limited to 95 percent cumulative of the total contract

amount.

- D. Final payment will be submitted after final acceptance of the pump and motors following the 30-day satisfactory operational test.

END

ATTACHMENT A**SUBMITTAL DATA SHEET**

Submit the following data with Shop Drawings for each size of Pumping Unit:

Submersible Sewage Pumps

Veramendi Lift Station		
Item No.	Description	Pump Numbers (1, 2)
1	Make and Type Design	
2	Rated Speed	
3	Casing Material	
4	Impeller Diameter and Material	
5	Max. Impeller Diameter for Casing	
6	Diameter of Suction Flange	
7	Diameter of Discharge Flange	
8	Shutoff Head	
9	Diameter of Shaft at Impeller	
10	Maximum Brake Horsepower	
11	NPSH Required at Rated Head	
12	NPSH Required at Minimum Head	
13	Suction Specific Speed	
14	Specific Speed	

Motor Data

Item No.	Description	Pump Numbers (1, 2)
1	Rated Brake Horsepower	
2	Rated Full Load Speed	
3	Full Load Efficiency	
4	3/4 Load Efficiency	
5	Full Load Power Factor	
6	3/4 Load Power Factor	
7	Maximum Thrust Rating	
8	Locked Rotor KVA	
9	Frame Size	
10	Enclosure Type	

11	Locked Rotor Amperes (LRA) at rated voltage	
12	NEMA Starting Code Letter	

Weight

Item No.	Description	
1	Complete Pumping Unit	

END OF ATTACHMENT

**Item No. 523
Floor Access Doors****523.1 Description**

This item shall govern the installation of access doors. This Section covers the labor, materials, equipment and services needed to install access doors, complete as indicated on the Drawings.

523.2 Quality Assurance/Acceptable Manufacturers:

- A. Products that comply with the Specifications by the following manufacturers will be acceptable:
 - 1. Halliday Products, Inc.
 - 2. U.S.F. Fabrication
 - 3. K&B Steel
 - 4. EJ

523.3 Submittals

The submittal requirements of this specification item shall include:

- A. Shop Drawings.
- B. Operation and Maintenance Manuals.
- C. Structural calculations demonstrating that the door design meets the direct loading requirements listed in 523.7 or 523.8, as applicable, with a minimum fatigue life of 100,000 cycles. The structural calculations shall be signed and sealed by a professional engineer licensed in the state of Texas.

523.4 Delivery and Storage

Ship products in protective wood crates. Leave in crates until ready to install. Store on wood platform raised 6 inches above surrounding grade and protect with weather resistant covering.

523.5 Job Conditions

Floor access door frames shall be set into forms as concrete is placed. Be sure that frames are set and braced to prevent movement during placement of concrete.

523.6 Guarantees and Warranty

Manufacturer shall warrant that the complete system shall be free from defective material and workmanship for a minimum period of 5 years from date of Owner acceptance. The warranty shall be provided in writing starting from the date of acceptance by the Owner.

523.7 Floor Access Door For Pedestrian Loading (300 PSF)

- A. Door leaf shall be minimum 1/4-inch aluminum diamond pattern reinforced to support a minimum live load of 300 psf with a maximum deflection of 1/150th of the span.
- B. The frame shall be extruded aluminum with anchor flange around the perimeter.
- C. Door shall have sufficient number of compression spring operators to ensure that 15 lb. or less pull is required to open any single door leaf, and an automatic hold-open arm release handle.
- D. The opening arm for the door leaf shall be lockable with a standard pad lock to control unauthorized entry.
- E. Doors shall be outfitted with hold open arms to keep the covers in their upright, open positions.
- F. Doors shall be outfitted with a recessed lifting handle.
- G. All hardware shall be Type 316 stainless steel.
- H. Bituminous coating shall be applied to the surfaces in contact with concrete.
- I. Use channel frame when there is a concern of water or other liquids entering the access opening. Channel Frames are equipped with a drain port.
 - 1. Channel frames shall be provided with a 1-1/2-inch drainage coupling and shall be located in the corner of the frame.
- J. Door shall be outfitted with nut rail on all four sides for attaching hardware if hardware will be required to hang off access hatch.
- K. Door shall be outfitted with aluminum skirting that makes the overall height of the frame equal to the top slab thickness, for casting into concrete.
- L. For submersible pump applications where the cable penetrates through the hatch:
 - 1. Coordinate closely with pump/hatch manufacturers during design phase and clearly show the location of the notch on the Drawings.
 - 2. Provide a sufficient notch in the leaf plating to allow the submersible pump cable to penetrate the surface. Provide rubber grommet along the cut edge of the hatch leaf to prevent wear on the cables penetrating the opening. Reference drawings for size and location.
- M. Contractor shall verify that proposed equipment will fit through the access door opening and that the location of the doors will allow for easy removal of the equipment. Contractor shall provide the size doors specified if adequate or a larger size as required to remove the equipment from the vault, wet well, or other installation.

523.8 Floor Access Door For Non-Occasional Traffic Loading (H20-44)

- A. Door leaf shall be 1/2-inch galvanized steel diamond pattern reinforced to support AASHTO H-20-wheel load with a maximum deflection of 1/150th of the span.

- B. The frame shall be 1/2-inch thick steel with anchor studs welded around the perimeter.
- C. Cover shall be bolted to frame when closed with 316 stainless steel allen-head bolts to allow for direct traffic loading. An allen-head socket with torque wrench shall be provided with the door.
- D. Door shall have sufficient number of compression spring operators to ensure that 45 lb. or less pull is required to open any single door leaf, and an automatic hold-open arm release handle.
- E. The opening arm for the door leaf shall be lockable with a standard pad lock to control unauthorized entry.
- F. Doors shall be outfitted with hold open arms to keep the covers in their upright, open positions.
- G. Doors shall be outfitted with a recessed lifting handle.
- H. All hardware shall be Type 316 stainless steel.
- I. Use channel frame when there is a concern of water or other liquids entering the access opening. It is equipped with a drain port.
 - 1. Channel frames shall be provided with a 1-1/2-inch drainage coupling and shall be located in the corner of the frame.
- J. Door shall be outfitted with nut rail on all four sides for attaching hardware if hardware will be required to hang off access hatch.
- K. Door shall be outfitted with galvanized steel skirting that makes the overall height of the frame equal to the top slab thickness, for casting into concrete.

523.9 Safety Grate System

- A. Provide aluminum safety grate rated at 300 psf.
- B. Safety grate shall be designed to combine covering of the opening, fall through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.
- C. The safety grate shall be powder coated safety orange color. The coating shall be a minimum thickness of 4 mils and be shop applied and cured per manufacturer recommendations.
- D. Grate openings shall be a minimum of 4 inches by 6 inches to allow for visual inspection, limited maintenance, and other adjustments while the safety grate is left in place. All hardware including hinges shall be stainless steel.
- E. All hardware including hinges shall be stainless steel.
- F. For H20-44 hatches, the safety grate system shall not bear any loading from the leaf above.

523.10 Execution

Floor Access Door Installation

- A. Floor access doors and frames shall be installed in accordance with manufacturer's written instructions. Access door frames shall be cast into concrete structures. Concrete shall be worked around frame to ensure complete embedment of anchors. Frame shall be secured to prevent movement during placement of concrete. Frames shall be level.
- B. Provide copper or PVC drains as necessary for access doors with integral drains. Connect drain piping to drain outlet of channel frame and extend to nearest wall of the structure. Drain shall not be routed across any access ladders or floor walking surfaces.
- C. Floor access door frames shall be set level within 3/32 inch across diagonal corners, unless floor slab is designed to be out of level, then the access door shall be set to same place as floor slab.
- D. Aluminum access door frames in contact with concrete shall be given a heavy coat of bituminous paint prior to installation.
- E. For non-occasional traffic loaded hatches (H20-44), the allen-head bolts must be tightened to 25 foot-pounds of torque and securely fastened using Loctite 242 whenever the cover is closed.

523.11 Measurement

"Installation of Access Doors", when included in the contract as a pay item, will be measured per each item successfully installed.

523.12 Payment

All work performed by this item will be considered subsidiary to other bid items unless it is included as a separate bid item in the contract documents then all work performed as required herein and measured as provided under "Measurement" will be paid for at the unit bid price. The bid prices shall include full compensation for furnishing all labor; all materials; all royalty and freight involved; all hauling and delivering on the road; and all tools, equipment and incidentals necessary to complete the work. Payment will not be made for unauthorized work.

Payment, when included as a contract pay items, will be made under one of the following:

Pay Item: Floor Access Doors Per Each.

Pay Item: Vault Access Hatches Per Each.

End

Item No. 530
High Performance Coatings

530.1 Description

Furnish labor, materials, equipment and incidentals necessary to apply protective coatings to material and equipment as specified herein, including the preparation of surfaces prior to application of coatings.

- A. Protective coatings are special coatings to be used at specific locations or on specific surfaces as indicated herein in that every surface of every description, except those which are specifically noted not to receive a coating finish, must be covered by a paint system as specified in this Section.
- B. Protective coatings must be applied to the following surfaces:
 - a. Metal surfaces located outside of buildings and other structures anywhere on the Site.
 - b. New piping and valves
 - c. Petrolatum (Wax) Tape at the following locations:
 - i. Buried flexible couplings.
- C. The following must not be coated and must be protected from drips, overspray, etc. unless indicated otherwise
 - 1. Stainless steel piping, materials and equipment.
 - 2. Galvanized steel piping, materials and equipment unless specifically indicated to be coated.
 - 3. Aluminum materials and equipment.
 - 4. Interior electrical items.
- D. Special applications for painting include the following:
 - 1. Aluminum surfaces in contact with or embedded in concrete must be coated with a zinc rich primer. Primer shall be:
 - i. Tneme-Zinc; Tnemec Company, Inc.
 - ii. MasterProtect P 8100AP; Master Builders Solutions US LLC.
 - iii. Approved equal.
 - 2. Buried pipe and valves must receive a shop applied protective coating as described in the appropriate Section of the Specifications.
- E. Contain, treat, and dispose of any dust, spray, drainage, or spillage resulting from coating operations. It is the Contractor's responsibility to determine if the materials to be disposed of are classified as Hazardous Waste. Disposed of waste, hazardous or otherwise, must be in accordance with applicable regulations. Contractor must be aware of and understand the regulations concerning disposal of waste generated by coating operations.

530.2 Quality Assurance

- A. Acceptable Manufacturers: Products which comply with the Contract Documents and are manufactured by the following companies will be acceptable:

1. Tnemec Company, Inc.
2. Carboline.
3. PPG Protective & Marine Coatings.
4. The Sherwin-Williams Company.
5. Akzo Nobel / International Paint, LLC.
6. ICI Devoe High Performance Coatings.
7. Plasite Protective Coatings.

It is desired that the paint products be furnished by as few manufacturers as possible to meet the requirements of the Specifications. Coating products of the same type must be supplied by the same manufacturer. Do not mix products from different sources.

- B. Applicator's Qualifications: Applicators must be qualified in this line of work and have a minimum of 5 years of experience in the application of the protective coatings of the types specified herein. Submit a list of recent projects and names of references for those projects.
- C. Product Quality:
1. Use only the coatings specified in this Section. Use only those thinners and solvents recommended by the manufacturer, only in the amounts necessary to produce the manufacturer's recommended spreading rate, and in amounts not exceeding the maximum quantities stated in the manufacturer's literature.
 2. The coating material must not show excessive settling in a freshly opened full can and must be easily re-dispersed with a paddle to a smooth, homogeneous state. It must show no curdling, livering, caking, or color separation and must be free of lumps or skim surfaces.
- D. Inspection:
1. Inspect and provide substrate surfaces prepared in accordance with the Contract Documents and the printed directions and recommendations of paint manufacturer whose product is to be applied.
 2. Provide Engineer and NBU minimum 3 days of notice prior to start of surface preparation work or coating application work.
- E. Perform Work only in the presence of Engineer, unless Engineer grants prior approval to perform such Work in Engineer's absence. Approval to perform Work in the Engineer's absence is limited to the current day unless specifically noted to extend beyond the completion of the workday.
1. Inspection by the Engineer, or the waiver of inspection of any particular portion of the Work, does not relieve the Contractor of responsibility to perform the Work in accordance with the Contract Documents.
 2. Contractor is solely responsible for testing for this Section, at no further cost to the Owner. Engineer may also make such tests if it is considered necessary. Cooperate with the Engineer, providing equipment, scaffolds, and other equipment as requested by the Engineer.
- F. Testing Equipment: Furnish the testing apparatus necessary for testing coatings, including the following:
1. One set of U.S. Department of Commerce thickness calibration plates, certified

- by the National Bureau of Standards, to test dry film thickness.
2. Wet-film thickness gauges. Give one to Owner's representative. Each painter must keep one to test paint as it is applied.
 3. One electronic dry-film thickness gauge capable of measuring 0-200 mils with calibration standards approved by the Bureau of Standards.
 4. One Elcometer 319 Dewpoint Meter or approved equal.
 5. One Tinker and Razor Model M 1 Holiday Detector and recommended wetting agent and/or High Voltage Holiday Detector if required for coating thickness specified.
 6. One set of SSPC-VIS 1, 3 and 4 - Visual Standards as applicable.
- G. Testing Reports: Submit an inspection report for each coating applied on the Project. The testing report must be completed on a form furnished by the Engineer and must bear the signature of the Contractor and the Owner's representative.

530.3 Submittals

The following Product Data for products, including manufacturer's data sheets, are due prior to ordering coating and surface preparation materials:

- A. Coating manufacturer's color selection literature for coating materials and caulk.
- B. Sample warranty document for products.
- C. Provide certification from the manufacturer that all coatings will not contain more than 0.06 percent by weight of lead in the cured coating for each coat applied.
- D. Coating manufacturer's Product Information and Safety Data Sheets (SDS) for each coating and caulk material. Product Information must include the following:
 1. The manufacturer's published instructions for use in specifying and applying all proposed coatings.
 2. Application instructions written and published by the coating manufacturer.
 3. All anticipated limitations, precautions and requirements that may adversely affect the coating, that may cause unsatisfactory results after the application or that may cause the coating not to serve the purpose for which it was intended, must be clearly and completely stated in the instructions. Limitations and requirements must include, but are not necessarily limited to the following:
 - i. Surface preparation.
 - ii. Method(s) of application.
 - iii. Thickness of each coat (maximum and minimum DFT).
 - iv. Drying and curing time of each coat.
 - v. Time (minimum and maximum) allowed between coats.
 - vi. Thinner and use of thinner.
 - vii. Proper mixing of coating before application.
 - viii. Weather limitations during and after application (temperature and humidity, time weighted).
 - ix. Physical properties of coating, including percent solids content by volume.

- x. Equipment settings (air cap, fluid tip, equipment pressure settings, etc.).
- xi. Pot life at various temperature and humidity conditions.
- xii. Provide documentation that interior coating system is compatible with the cathodic protection system.

The following samples are required prior to ordering the materials:

- A. Three samples of selected exterior finish colors for approval on 6-inch by 6-inch swatches. Label each swatch with the manufacturer's name, coating name/type, color name and number.

The following Product Data is required prior to coating Work:

A. Coating Plan:

- 1. Anticipated coating process schedule by date, including dates when hold-point inspections are anticipated. Schedule must indicate detailed activities on a daily basis.
 - 2. Detailed procedures and schedule for all pre-cleaning, surface preparation and application of coating, including touch-up and repair procedures for all coating systems.
 - 3. Recoat schedule on the submitted coating materials.
 - 4. Data sheets must include curing characteristics and recommendations regarding complete coating curing.
 - 5. Provide a written plan documenting how spent cleaning debris and/or paint over spray or droplets will be contained/confined to the jobsite and tank site during the surface preparation and coating application operations. Reasonable care must be exercised by the Contractor to prevent damage, nuisance, or hazardous conditions to adjacent or nearby property owners. Include all materials and method to be used for protection of exterior surfaces and allow for recovery and disposal of paint scraps and blast media.
- B. Provide documentation on proposed containment system methods for blasting and coating operations.
 - C. Contractor must submit evidence of notification of the appropriate office of the Texas Commission on Environmental Quality (TCEQ) prior to abrasive blasting as required. Submit copies of any obtained permits.
 - D. Coating Manifest - Within 48 hours of coating delivery to the jobsite, the Contractor must record the batch number stamped on each coating container and submit a typed list to the Owner's representative. Minimum information required is listed below.
 - 1. Date of delivery to jobsite.
 - 2. Name and signature of superintendent recording the data.
 - 3. List of batch number including corresponding coating identification, color, date of manufacture and volume of each container.
 - E. The following Certified Test Report(s) are required prior to coating Work:
 - 1. SDS sheets for all abrasive to be used on the Project.
 - 2. Certification and laboratory test results indicating recycled metallic abrasive per SSPC. AB 2 or 4 and atomic absorption test results.

530.4 Standards

The following standards dictate standards used in project:

A. NSF International (NSF) / American National Standards Institute (ANSI):

NSF/ANSI Standard 61	Drinking Water System Components – Health Effects
NSF/ANSI/CAN 600	Health Effects Evaluation and Criteria for Chemicals in Drinking Water

B. ASTM International (ASTM):

ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM D523	Standard Test Method for Specular Gloss
ASTM D610	Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4258	Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4259	Standard Practice for Abrading Concrete
ASTM D4260	Standard Practice for Liquid and Gelled Acid Etching of Concrete
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4285	Standard Test Method of Indicating Oil and Water in Compressed Air
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester
ASTM D4787	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
ASTM D5162	Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
ASTM D6386	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Pull-Off Adhesion Testers
ASTM D7682	Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty

ASTM E337	Standard Practice Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

C. American Water Works Association (AWWA):

AWWA C210	Liquid-Epoxy Coating and Linings for Steel Water Pipelines
AWWA C222	Polyurethane Coatings and Linings for Steel Water Pipe and Fittings

D. Consumer Product Safety Act, Part 1303.

E. Environmental Protection Agency (EPA).

F. International Concrete Repair Institute (ICRI):

Technical Guideline No. 03732	Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers and Polymer Overlays
Standard 310.2	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair with CSP Chips

G. Association for Materials Protection and Performance (AMPP) (formally NACE/SSPC):

NACE TPC2	Coating and Lining for Immersion Service: Chapter Safety, Chapter 2 Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
NACE SP0178	Design Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service
NACE SP0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE SP0178	Surface Finishing of Welds Prior to Coating; Weld Replica Only to be used with NACE SP0178
NACE RP0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape
SSPC-VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC-VIS 3	Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand Tool Cleaning
SSPC Vol. 1	Good Painting Practices
SSPC-AB 1	Mineral and Slag Abrasives
SSPC-AB 2	Cleanliness of Recycled Ferrous Metallic Abrasives
SSPC-AB 3	Ferrous Metallic Abrasives
SSPC-AB 4	Recyclable Encapsulated Abrasive Media in a Compressible Matrix
SSPC-SP 1	Solvent Cleaning
SSPC-SP 2	Hand Tool Cleaning
SSPC-SP 3	Power Tool Cleaning
SSPC-SP 11	Bare Metal Power Tool Cleaning
SSPC-SP I6	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

SSPC-PA 1	Shop, Field and Maintenance Painting of Steel
SSPC-PA 2	Determining Compliance to Required DFT
SSPC-PA 10	Guide to Safety and Health Requirements for Industrial Painting Projects
SSPC-PA 17	Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
SSPAC Paint #20	Organic Zinc Rich Primer, Type II
SSPC Guide 6 (CON)	Containment of Debris
SSPC Guide 12	Illumination of Painting Projects
SSPC Guide 15	Retrieval and Analysis of Soluble Salts
SSPC-SP 5/NACE 1	White Metal Blast Cleaning
SSPC-SP 6/NACE 3	Commercial Blast Cleaning
SSPC-SP 7/NACE 4	Brush - Off Blast Cleaning
SSPC-SP 10/NACE 2	Near - White Metal Blast Cleaning
SSPC-SP 13/NACE 6	Surface Preparation of Concrete

H. National Association of Pipe Fabricators (NAPF):

NAPF 500-03	Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings

I. Occupational Safety & Health Administration (OHS):

1915.35 Standards - 29 CFR	Painting
1926.62 Standards - 29 CFR	Lead

J. Texas Commission on Environmental Quality (TCEQ):

30 TAC Chapter 290, Subchapter D	Rules and Regulations for Public Water Systems

530.5 Environmental Conditions

1. Do not apply coatings under conditions that are unsuitable for the production of good results. Remove trash and debris from enclosed buildings and thoroughly clean prior to application of coatings. Do not begin application of coatings in areas where other trades are working, or where construction activities result in airborne dust or other debris. Do not apply coatings in conditions which do not conform to the recommendations of the coatings manufacturer.
2. Coatings must only be applied when conditions fall within the parameters listed in the manufacturer's printed data.
3. Contractor must provide dehumidification equipment sized to maintain dew point temperature 5 deg F or more above surface temperature of metal surfaces to be prepared and coated.
4. Do not apply any coatings when weather conditions are unfavorable. In the event that climatic conditions are not conducive for best results, postpone application of

coatings until conditions conform to the manufacturer's recommendations and the provisions of this Section.

5. Do not apply coatings to a wet or damp surface in wet or damp weather conditions, or when there is dust in the air. Surfaces exposed to direct sunlight must be shaded by awnings or other protective devices while coatings are being applied, if recommended by coating manufacturer. When necessary, provide temporary heating devices of a type that produces no fumes or water vapor which will discolor the paint system.
6. Heating and Dehumidification:
 - A. Dehumidification equipment must be used to control the environment during surface preparation, rehabilitation, coating application and coating curing at no additional cost to the Owner, if acceptable environmental conditions cannot be met.
 - B. If the Contractor cannot meet the required environmental conditions to apply the interior coating system per this Section and the coating manufacturer's written recommendations, Contractor will cease operations until approved dehumidification equipment has been provided and acceptable environmental conditions are achieved.
 - C. If coating system is applied without dehumidification or in conditions not acceptable by this Section and by the coating manufacturer's written requirements, Contractor must fully remove coating system applied and replace per the Engineer's direction.
 - D. Contractor must furnish all labor, materials, equipment, fabrication and quality control inspections, and all other incidentals required to control and maintain the environment of the reservoir within the parameters stated in this Section and must incorporate these and any other expenses into its bid.
 - E. Owner reserves the rights, in the event the dehumidification equipment is not performing to the minimum requirements stated in this Section, to require the Contractor to modify and or add additional equipment to satisfy the conditions of this Section, at the sole cost to the Contractor.
 - F. It is the Contractor's responsibility to provide adequate dehumidification equipment to meet this specification and the coating manufacturer's requirements of this Section and coating manufacturer's requirements. The coating manufacturer's limits of surface temperature, tank inside air temperature and relative humidity requirements will govern, if more stringent than the requirements stated within this Section.
7. Forced Ventilation:
 - A. Provide continuous forced fresh air ventilation when working inside of containment systems or enclosed areas that are not openly vented from the beginning of surface preparation through final coating operations and coating curing.
 - B. Forced ventilation must be supplied per the recoat time required by the coating manufacturer and at least 48 hours after the final coat has been applied.
 - C. From the beginning of interior coating applications to until the coating system is cured, the Contractor must monitor the air for the lower explosion limit (LEL) as published in the coating manufacturer's product SDS.
 - D. Contractor is responsible for supplying, installing and maintaining the forced ventilation system.

8. Containment System:

- A. Contractor must provide containment methods, either full or partial, which allows for the containment of the environmentally sensitive waste, dust and paint over spray that will be generated during the abrasive blasting and painting operation.
- B. Minimum Containment for Field Surface Preparation:
 - 1. Provide a minimum SSPC Guide 6 (CON) Class 3A.D1.E3 containment system when dry abrasive blasting.
 - 2. Provide a minimum SSPC Guide 6 (CON) Class 2W containment system when wet abrasive blasting. All water must be contained and properly disposed of.
 - 3. Provide a minimum SSPC Guide 6 (CON) Class 2P.E3 containment system when power tool cleaning.
- C. The ground surrounding the project area must be protected from all debris, emissions, dust, and other materials generated in the cleaning operations with a minimum of two layers of polyethylene covered with plywood or the same material used for the perimeter containment system.
- D. Containment is not required when blasting on the interior of a completely enclosed area (i.e. roof is in place) as long as no visible emissions are created.
- E. Contractor must ensure that no spent cleaning/blasting debris, dust, overspray, coating droplets, or emissions of any kind, escape to the atmosphere, or to adjacent buildings, private property, work sites, parking lots, etc.
- F. Owner reserves the right to stop Work or require containment, additional containment or different containment methods if the Contractor's operations create a nuisance beyond the tank site property line in the sole opinion of the Owner, the Engineer, the Owner's representative, any regulatory agency, or neighbor. All costs of providing an adequate containment system must be included by the Contractor in the Base Bid.
- G. Contractor will be responsible for all materials that are used and for any apparatus used to contain dust emissions, debris, overspray, and coating droplets. The containment system attachments to existing or proposed structures must be designed by a professional engineer, licensed in the state where the Project is located, not to impose excessive loading on the structure. Contractor must submit the designed and sealed details of the containment system on the tank.
- H. Any damage to the structure(s) as a direct or indirect result of the containment system must be repaired or sections replaced by the Contractor at no additional cost to the Owner. Neither the Owner, nor the Owner's Engineer, assumes any responsibility for the structural ability of the structure to support the containment system.
- I. If tarps are used as part of the containment system, the tarps must be an impervious, solid, flame-resistant material, reinforced with a fiber mesh and must allow as much light as possible to pass through the material.

9. Visible Emissions:

- A. Contractor must control visible emissions and releases while dust producing activities are underway.

- B. Visible emissions more than SSPC Guide 6, Level 1 (1 percent of the workday or 5 minutes in an 8-hour shift) are unacceptable. Sustained emissions of more than 1 minute, regardless of the total time of emissions for the day is unacceptable. If unacceptable emissions are observed, Contractor must shut down immediately and correct the situation and clean up any debris generated from the release to the satisfaction of the Engineer before continuing Work.

530.6 Working Conditions

- A. Provide adequate lighting at any location that coatings are being applied or testing is performed. Illumination must be of sufficient intensity to achieve good results. Provide explosion-proof lighting when required.
- B. Temporary ladders and scaffolds must conform to applicable safety requirements. Erect temporary scaffolds where needed to cover large areas. Provide ladders or scaffolding during testing procedures.

530.7 Materials

- A. Coating products are to be as follows:

Type A - Alkyd-Phenolic Universal Primer	
Manufacturer	Approved Coating
Tnemec	Series 37H Chem-Prime H.S.
Sherwin-Williams	Kem Kromik Universal
Akzo Nobel / International Paint, LLC	Interlac 573
Devco Coatings	Devprime 1403
Carboline	Carbocoat 150UP
PPG	Multiprime 4360

Type B - Epoxy-Polyamide Primer	
Manufacturer	Approved Coating
Tnemec	Series 66
Sherwin-Williams	Copoxyl Primer
Akzo Nobel / International Paint, LLC	Intergard 251; Intergard 269 for valves and gates, submerged structural steel and misc. metals, and submerged piping
Devco Coatings	Devran 201V Series
Carboline	890
PPG	Amercoat 385

Type C - Penetrating Epoxy Pre-Primer	
Manufacturer	Approved Coating
Tnemec	Approved Equal
Sherwin-Williams	Macropoxy 920 Pre-Prime
Akzo Nobel / International Paint, LLC	Interbond 600
Devoe Coatings	Approved Equal
Carboline	Rustbond Penetrating Sealer
PPG	Amerlock Sealer

Type D - Inorganic Zinc Primer (Minimum 80% Zinc by Weight)	
Manufacturer	Approved Coating
Tnemec	Series 90-98 Tneme-Zinc
Carboline	Carbozinc 12 VOC
Sherwin-Williams	Zinc Clad II Plus
PPG	Dimetcote 9 VOC

Type E - Organic Zinc Primer (Minimum 80% Zinc by Weight)	
Manufacturer	Approved Coating
Tnemec	Series 90-97 or 90G-1K97 Tneme-Zinc
Carboline	Carbozinc 859
Sherwin-Williams	Corothane I Galvapac
PPG	Amercoat 68HS
Akzo Nobel / International Paint, LLC	Interzinc 52

Type F - Alkyd Enamel	
Manufacturer	Approved Coating
Tnemec	Series 2H Hi-Build Tneme-Gloss
Sherwin-Williams	DTM Alkyd Enamel
Akzo Nobel / International Paint, LLC	Interlac 665
Devoe Coatings	Devlac 1431
Carboline	Carbocoat 8225
PPG	Fast Dry 35

Type G - Epoxy-Polyamide Coatings	
Manufacturer	Approved Coating
Tnemec	Series 66
Sherwin-Williams	Macropoxy 646 Epoxy
Akzo Nobel / International Paint, LLC	Intergurd 475HS; Interseal 670HS for valves and gates, PVC pipe and conduit, submerged structural steel and misc. metals, and submerged piping
Devoe Coatings	Bar-Rust 235
Carboline	Carboguard 60
PPG	Amerlock 385

Type H – NSF/ANSI 600 Coatings for Potable Water (NSF 61 Certified)	
Manufacturer	Approved Coating
Tnemec	Approved Equal
Sherwin-Williams	Sher-Plate 600 Epoxy
Akzo Nobel / International Paint, LLC	Interline 850 or Interseal 670HS (NSF colors)
Devoe Coatings	Bar-Rust 233H Series
Carboline	Carboguard 61
PPG	Amerlock 2/400

Type I - Aliphatic Polyurethane Enamel	
Manufacturer	Approved Coating
Tnemec	Series 1094 Endura-Shield
Sherwin-Williams	Hi-Solids Polyurethane
Akzo Nobel / International Paint, LLC	Interthane 990 Series
Devoe Coatings	Devthane 379 Series
Carboline	Carbothane 133HB (Satin) or Carbothane 134HG (High Gloss)
PPG	Pitthane Ultra Series

Type J - Silicone Aluminum Coatings for High Temperature	
Manufacturer	Approved Coating
Tnemec	Series 39 Silicone Aluminum
Sherwin-Williams	Heatflex 500 Aluminum

Type J - Silicone Aluminum Coatings for High Temperature	
Manufacturer	Approved Coating
Akzo Nobel / International Paint, LLC	Intertherm 50 Series
Devoe Coatings	Intertherm 50 Series
PPG	Hi-Temp 500
Carboline	Carbozinc 11; Finish: Thermaline 4700 Series (up to 1000 deg F); Thermaline 4900 (up to 450 deg F)

Type K- Epoxy Concrete Coating	
Manufacturer	Approved Coating
Tnemec	Series 46H-413 Hi-Build Tneme-Tar
Sherwin-Williams	Tar Guard Epoxy
Akzo Nobel / International Paint, LLC	Interzone 954
Devoe Coatings	Devtar 5A Series
PPG	Amercoat 78HB Coal Tar Epoxy
Carboline	Bitumastic 300M

Type L - Novolac Vinyl Ester/Novolac Epoxy Concrete Coating - High Friction Surface (HFS)	
Manufacturer	Approved Coating
Tnemec	Series G436 Perma-Shield / Chembloc Series 252SC
Sherwin Williams	Dura-Plate 8200
Akzo Nobel / International Paint, LLC	Ceilmate 380 / 242GF Flakeline System
PPG	SFT 675 / FlakeRez 8303
Carboline	Carboguard 510 Series / Plasite 4500 Series

Type M - High Solids Epoxy Siloxane	
Manufacturer	Approved Coating
Carboline	Carboxane 2000
Sherwin-Williams	Sher-Loxane 800
PPG	PSX 700 Polysiloxane

Type N - Epoxy Mastic	
Manufacturer	Approved Coating
Carboline	Carbomastic 15
Sherwin-Williams	Macropoxy 646 Epoxy
PPG	Amerlock 2/400 AL
Tnemec	Chembuild Series 135 or Series 133 ProTuff
AkzoNobel/International Paint, LLC	Interseal 670HS

Type O - Elastomeric Polyurethane Hybrid	
Manufacturer	Approved Coating
Carboline	Reactamine 760 Series
Sherwin-Williams	Poly-Cote 115
PPG	Amerthane 490
Tnemec	Elasto-Shield Series 406
AkzoNobel/International Paint, LLC	Polibrid 705E Elastomeric

Type P - Glass Flake Reinforced Epoxy	
Manufacturer	Approved Coating
Carboline	Carboguard 890GF
Sherwin-Williams	Sher-Glass FF
PPG	Amerlock 2/400 GF
Tnemec	Pre-Approved Equal Glass Filled Product
AkzoNobel/International Paint, LLC	Approved Equal

Type Q - 100 Percent Solids Epoxy for Wastewater	
Manufacturer	Approved Coating
Carboline	Plasite 4550-S Novolac Epoxy
Sherwin-Williams	Dura-Plate 6000 Amine Epoxy
PPG	Novaguard 890 or Novaguard 810 Novolac Epoxy
Tnemec	Perma-Glaze Series G435 or Series G436 Modified Polyamine Epoxy

B. AWWA C210 Liquid-Epoxy Coatings and Linings for Water Pipe and Fittings

1. Line the piping with a liquid epoxy lining in accordance with AWWA C210, with a total thickness of 16 mils minimum DFT. Lining must be factory/shop applied. Install flanged and coupling connections as required to field install and prevent damaging the interior lining by welding as approved by the Engineer.
2. All lining materials must meet the applicable requirements of NSF/ANSI/CAN 600 according to the requirements of NSF/ANSI/CAN 61, including the most current health effects criteria for xylenes, toluene and ethylbenzene for the pipe diameter for which it is being applied.
3. Manufacturer must provide documentation that the product submitted is approved for the diameter of pipe in which it will be applied.
4. Approved Manufacturers:
 - i. 3M Scotchkote
 - ii. Carboline.
 - iii. PPG.
 - iv. Tnemec Company, Inc.
 - v. Sherwin-Williams Company.

E. Petrolatum (Wax) Tape:

5. Petrolatum (wax) tape must be installed per the manufacturer's written recommendations. Provide all primers and appurtenant materials as required for installation per the recommendations.
6. Approved Manufacturers:
 - i. Trenton Corp. - Trenton Primer and #1 Wax-Tape.
 - ii. Denso North America, Inc. - Denso Paste and Densyl Tape.
 - iii. Approved equal.

F. Pipe Wrap Tape System:

1. System must be designed to mechanically protect coated piping from corrosion and abrasion in above ground, below ground and submerged conditions and be compatible with specified pipe coating system(s).
2. System must be UV resistant and may be constructed of HDPE, PVC, or fiberglass with an adhesive backing on one side for application to coated piping.
3. System must include a fiberglass reinforced outer shield for abrasion resistance and be able to be top coated for aesthetics.
4. Approved Manufacturers:
 - i. SealForLife.
 - ii. Denso North America, Inc.
 - iii. Approved equal.

G. Cold Galvanizing Compound:

1. Cold galvanizing compounds must meet the performance requirements of ASTM A780 and SSPC Paint 20. Cold galvanizing compounds are to be used for repair of damaged or corroding galvanized coatings. Cleaning and surface preparation is to be as indicated by the manufacturer. 95% zinc by weight, minimum.
2. Approved Manufacturers:
 - i. Rust-Oleum – 7000 System Cold Galvanizing Compound.
 - ii. ZRC – Galvanizing Compound.
 - iii. Approved Equal.

530.8 Color Selection

- A. The color chart must include the complete available range of colors, including tints and shades. Owner will select the colors during construction.
- B. Use a multi-color system coating for any surface receiving more than one coat. Each coat must be tinted differently from the preceding coat in a manner that will allow the various coats to be easily distinguished. Colors must generally be from light to dark shades, but the Contractor may have the option to select tint shades to ensure coats will receive adequate coverage without bleeding or otherwise showing through the preceding coat.
- C. Piping and equipment must be color coded in accordance with the requirements of the TCEQ.

530.9 Delivery and Storage

- A. Deliver coating products to the jobsite in original unopened containers, with manufacturer's label and batch number attached. Do not apply products until the Owner's field representative has approved the product for use.
- B. Use one location at each jobsite for the storage of coating products. Protect the floor from spills and other damage. Protect the products from extreme heat or cold. Keep containers covered. Keep the storage rooms clean of trash and debris. Dispose of oily or used rags daily. Under no circumstances will they be allowed to accumulate. Take precautions to prevent fires. The storage of flammable liquids must comply with the city, state, or other fire codes.
- C. Storage of coatings and other products must be in accordance with the manufacturer's requirements. Coatings that have been damaged or not stored properly must not be applied and must be removed from the jobsite.
- D. All products and coatings that are not approved for the Project must be removed from the jobsite and must not be stored at the jobsite.
- E. All materials must be delivered to the jobsite in original sealed containers with the date of manufacture and batch number stamped thereon by the coating manufacturer. Materials are subject to random observations by the Owner's representative at the jobsite.

530.10 Construction Methods**A. General**

1. All coatings must be applied in strict conformance with the coating manufacturer's published specifications, this Section, or as approved by the Engineer.
2. Surfaces which will be inaccessible after installation must be coated prior to installation or must be coated and approved in stages as the Work is installed.
3. Engineer will approve surfaces for application of coatings at each stage. Any material that is coated prior to the Engineer's approval will be stripped back to bare metal and repainted.
4. At least 7 days or as required by the coating manufacturer, must be allowed for drying of finished surfaces before any machinery can be placed into service.
5. The number of coats called for in this Section are considered the minimum required. If more coats are required to provide the specified dry film thickness or for complete coverage and uniform appearance, they must be provided at no additional cost to the Owner.
6. Illumination equipment must be provided by the Contractor in accordance with SSPC Guide 12. Explosion-proof lights and electrical equipment must be provided. The minimum illumination at the surface of the work during surface preparation and coatings is 215 lux (20 fc). The minimum illumination during inspection is 538 lux (50 fc). Whenever required by the Owner's representative, the Contractor must provide additional illumination and necessary supports to cover all areas to be inspected.

B. Steel Surface Preparation

1. The adequacy of the preparation of steel surfaces will be determined by comparing the surface with SSPC VIS 1 "Pictorial Surface Preparation Standards for Painting Steel Surfaces" and SSPC VIS 3 "Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand Tool Cleaning." Prepare surfaces in accordance with the following requirements:
 - a. SSPC-SP 1 — Solvent Cleaning.
 - b. SSPC-SP 2 — Hand Tool Cleaning.
 - c. SSPC-SP 3 — Power Tool Cleaning.
 - d. SSPC-SP 5 / NACE 1 — White Metal Blast Cleaning.
 - e. SSPC-SP 6 / NACE 3 — Commercial Blast Cleaning.
 - f. SSPC-SP 7 / NACE 4 — Brush-Off Blast Cleaning.
 - g. SSPC-SP 10 / NACE 2 — Near-White Blast Cleaning.
 - h. SSPC-SP 11 — Power Tool Cleaning to Bare Metal.
2. The resulting surface profile must be in accordance with the coating manufacturer's recommendations.
3. "Solvent Cleaning" must be performed prior to subsequent surface preparation, including abrasive blast cleaning.

4. All sharp edges and welds must be ground smooth to a rounded contour and all weld splatter must be removed prior to abrasive blasting. Edges of metal to be coated must be rounded to a minimum of 1/16-inch radius of chamfered a minimum of 1/16 inch at an angle of 45 degrees.
5. Welds and adjacent areas:
 - a. Prepared such that there is:
 - I. No undercutting or reverse ridges on the weld bead.
 - II. No weld spatter on or adjacent to the weld or any other area to be painted.
 - III. No sharp peaks or ridges along the weld bead.
 - IV. Grind embedded pieces of electrode or wire flush with the adjacent surface of the weld bead.
 - b. Weld profiles must conform to NACE RP0178, Profile 'D'.
- C. Ductile Iron Pipe and Fittings Surface Preparation
 1. Prepare surfaces in accordance with the following requirements:
 - a. NAPF 500-03-01 — Solvent Cleaning.
 - b. NAPF 500-03-02 — Hand Tool Cleaning.
 - c. NAPF 500-03-03 — Power Tool Cleaning.
 - d. NAPF 500-03-04 — Abrasive Blast Cleaning for Ductile Iron Pipe.
 - e. NAPF 500-03-05 — Abrasive Blast Cleaning for Cast Ductile Iron Fittings.
 2. "Solvent Cleaning" must be performed prior to subsequent surface preparation as specified in NAPF 500-03.
- D. Petrolatum (Wax) Tape
 1. Petrolatum (wax) tape must be installed per the manufacturer's written recommendations. Provide all primers and appurtenant materials as required for installation per the recommendations.
 2. Tape must be installed on all buried flexible couplings and at locations indicated on the Drawings and as specified.
- E. Pipe Wrap Tape System
 1. Tape must be installed per the manufacturer's written recommendations. Provide all primers and appurtenant materials as required for installation per the recommendations.
 2. Tape must be installed on all piping at the transition between above grade and below grade. Coat piping a minimum of 2 feet vertically above and below the ground surface.
 3. Paint wrap to match adjacent piping.
- F. Concrete Surface Preparation
 1. The adequacy of the preparation of concrete surfaces will be determined by comparing the surface with ICRI Surface Finish Comparators. Prepare surfaces

in accordance with the following requirements and the coating manufacturer's recommendations:

- a. SSPC-SP 13 / NACE 6 — Surface Preparation of Concrete.
 - b. ICRI CSP 3 – 5, or as required by the coating manufacturer.
2. Allow a minimum of 28 days curing time to elapse before coatings are applied. Concrete surfaces which are scheduled to receive coatings must be in accordance with the coating manufacturer's moisture requirements. Contractor must provide any primers required by the coating manufacturer to address outgassing, as needed.
3. Contractor must field verify that the pH of the concrete is suitable for application per the coating manufacturer's product requirements.
4. Bug holes, air pockets, voids or imperfections in the concrete surface must be filled or patched with a cementitious resurfacing material approved by the coating manufacturer.
5. All coating terminations points, including from concrete to metal are to include a 1/4-inch key cut.
6. Concrete Surface Preparation Inspection:
 - a. Adhesion Testing:
 - i. Tensile testing of the surface preparation must be performed by the Contractor using a Type 4 or Type 5 pneumatic adhesion testing equipment in accordance with ASTM D7234 using 2-inch diameter dollies for concrete surface adhesion testing. Provide a minimum of three tests (dollies) per area and coating system. Engineer will select location of test dollies.
 - ii. Concrete surface or applied coating must be scored for concrete adhesion testing.
 - iii. Adhesive failure greater than 50 percent of the dolly surface area indicate inadequate surface preparation.
 - iv. Cohesive failures which result in loss of sound concrete will be acceptable provided the loss is greater than 50 percent of the dolly surface area.
 - v. Low adhesion cohesive failures with a thin layer of concrete due to weak concrete or laitance over 50 percent of the dolly surface will be rejected.
 - b. Concrete Soundness: Concrete soundness will be determined using the scratching or hammer impact methods as defined in SSPC-SP 13.
 - c. Moisture Content: Moisture must be tested as specified in SSPC-SP 13 and in accordance with ASTM D4263 and ASTM F1869 (for conditioned spaces). Moisture content cannot exceed the moisture content recommended by the coating manufacturer.

G. Surface Preparation

1. Clean and degrease surfaces prior to abrasive blasting by solvent cleaning as specified using solvents, detergent/water, emulsions, and steam. Proposed

method must be documented in the coating plan. Contractor must contain and properly dispose of all runoff and debris from cleaning.

2. If the following conditions exist or are prevalent, surface preparation and coating must be delayed or postponed until conditions are favorable. Each day's coating must be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions or changes. No surface preparation can begin or coating applied:
 - a. When the surface, air or material is below or above the manufacturer's printed instructions.
 - b. When surfaces are wet or damp.
 - c. During weather conditions of rain, snow, fog or mist.
 - d. When the air and steel temperature is less than 5 deg F above the dew point temperature.
 - e. If the relative humidity is above 85 percent.
 - f. When it is expected that the dew point, air and/or surface temperature will be below or above the coating manufacturer's recommended temperatures within 4 hours after applications of coating, minimum. Coating manufacturer may require additional time between application and temperature and weather changes.
3. Shop Surface Preparation:
 - a. Notify Engineer at least 7 days prior to start of shop blast cleaning to allow for inspection of the Work during surface preparation and shop application of paints. Work is subject to the Engineer's approval before shipment to the jobsite.
 - b. Items such as structural steel, metal doors and frames, metal louvers, and similar items as reviewed and approved by the Engineer may be shop prepared and primed. Centrifugal wheel blast cleaning is an acceptable alternate to shop blast cleaning. Blast clean and prime in accordance with the Specifications.
 - c. Prepare surfaces by abrasive blasting as specified and apply shop prime coat. Shop primed steel plates must not have primer extended within 4 inches along all edges to be welded. All primer within 4 inches of an area to be welded must be removed prior to welding. Welding of painted surfaces will not be allowed.
4. All pre-assembled shop primed items must be prepared in accordance with these specifications and inspected by the Owner's representative before and after priming.
5. Abrasive Blasting:
 - a. Prior to commencing abrasive blasting operations, the Contractor must perform a test blast to verify that the surface cleanliness and profile meet the requirements of this Section and meet the coating manufacturer's requirements for the coating to be applied. If the test section does not meet the requirements, the Contract must make changes to the abrasive materials and/or methods to provide suitable blast.
 - b. Abrasive blast only the amount of surface area which can be primed the same day or before any rust starts to form, whichever occurs first. Areas which are

- not painted the same day must be re-blasted on the day the prime coat is applied.
- c. Shrouding or recovery of all blast material will be mandatory during all exterior blasting.
 - d. Contractor must contain all waste and process discharge in accordance with the accepted methods for the process and materials that are in abatement.
 - e. Where abrasive blast cleaning will not remove or properly prepare metal surfaces, hand and/or power tool cleaning must be used to remove such conditions as weld splatter, laminations and radius-sharp edges. Hand tool or power tool must be used on areas less than 2 feet in diameter or smaller or on corners and edges.
 - f. All abrasive blast equipment must be equipped with, including but not limited to the following:
 - i. Noise reducing devices.
 - ii. Hose coupling safety devices.
 - iii. Electrical grounding devices.
 - iv. Moisture traps and filters.
 - v. Fresh air hoods for all blasters.
 - vi. "Dead Man" switches on all blast hoses.
 - vii. Air dryers.
6. Surface profile must be in accordance with manufacturer's printed requirements.
7. The adequacy of the preparation of surfaces must be determined by comparing the surface with SSPC-VIS 1, SSPC-VIS 3, NACE RP0178 and ICRI Surface Finish Comparators.
8. Adequate surface preparation must be verified throughout surface preparation per SSPC-PA 17. Minimum testing requirements:
- a. Test the surface profile within the first 15 minutes and one additional time during each work shift or 12-hour period, whichever is shorter for each gun or blasting apparatus used or at any time the process producing the acceptable profile indicated above is changed, as interpreted by the Engineer.
 - b. Select a minimum of three 6-inch square locations and take two readings. The average to the two readings is a "profile measurement." The group of three locations is the "location average." The location average must be within the specified profile range.
 - c. Contractor must report the location averages (lowest location average and highest location average, and the profile measurement for each surface preparation apparatus.
 - d. If the substrate has been previously coated, an existing profile may exist. Contractor must adjust blast media size to ensure that the resulting surface profile meets the profile required.
9. Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning", or similar words of equal intent are used in the Specifications or

in paint manufacturer's specifications, they are understood to refer to the applicable specifications indicated.

10. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacuum-blasting methods may be required. Coating manufacturer's recommendations for wet blast additives and first coat application will apply.
11. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wiped with a tack cloth.

H. Preparation Of Existing Coated Or Shop Primed Surfaces

1. General:

- a. Factory-applied primers to equipment must be those specified or verified by the Contractor to be compatible with the specified coating systems. Where possible, notify manufacturers which shop prime coats will be required in order to be compatible with field-applied finish coats.
- b. Where equipment is purchased which has the manufacturer's standard primer or a factory finish which is other than as specified in this Section, remove the factory-applied paint system or apply passivators or other special coatings as required to make the surface compatible with the finish coat specified.
- c. Do not apply any coating to machinery, piping, or other surfaces before testing has been completed and systems approved. Any damage to coatings resulting from subsequent corrective procedures must be stripped back to bare metal and repainted with the appropriate paint system as directed by the Engineer.
- d. Check for compatibility when applying coatings over existing coatings. Apply a test patch of the recommended coating system, covering at least 2 to 3 square feet or as directed by the Engineer. Allow to cure 1 week before testing adhesion per ASTM D3359 in the presence of the Engineer. If adhesion does not meet the manufacturer's published data, consult with the Engineer.
- e. Shop primed or coated surfaces must be reviewed with the Engineer to determine if the extent of damage to the coating and suitability of finish coats to adhere to shop applied coats.
- f. If a cured epoxy, polyurethane, or plural-component material is to be top coated provide brush-off blast as specified herein or as recommended by the coating manufacturer.
- g. Surface preparation recommendations of coating manufacturer are subject to approval of the Engineer.

2. To Be Recoated or Final Coated:

- a. Solvent clean.
- b. Perform touch-up repairs of existing coating.
- c. Asphaltic coated ductile iron pipe will require an application of a seal coat prior to the application of a cosmetic finish coat.

3. Touch-Up Repairs:
 - a. Clean loose, abraded, or damaged coatings to substrate by power tool to bare metal per SSPC-SP 11 and/or NAPF 500-03-03 "Power Tool Cleaning."
 - b. Feather surrounding intact coating.
 - c. Apply one spot coat of the specified primer to bare areas overlapping the prepared existing coating.
 - d. Apply one full finish coat of the specified primer or finish coat(s) overall.
4. Application of a Cosmetic Coat:
 - a. The exact nature of shop-applied coatings is not known in all cases.
 - b. Check compatibility by application to a small area prior to starting the coating.
 - c. If lifting or other problems occur, request disposition from the Engineer.

530.11 Application

- A. Contractor and painting technicians are responsible for the application of the coating system and must have current applicator approvals from the coating manufacturer, as required.
- B. After abrasive blast cleaning, dust and spent abrasive must be removed from the surfaces by vacuum process or with clean, dry, oil-free compressed air.
- C. The prime coat must be applied as soon as possible after the blasting and surface cleaning is completed, inspected and approved by the Inspector. Blasted surfaces must be coated before rust forms on the surface. No prepared surface will be allowed to receive a coating if "rust bloom" or surface discoloration has occurred. All blasted surfaces must be coated to within 6 inches of the edge of a blasted area. No visible rust must be coated under any circumstances, including rust bloom or if discoloration has occurred, regardless of elapsed time between blasting and coating. Leave an uncoated strip of exposed metal to clearly identify where abrasive blasting was halted.
- D. Provide mist coat if recommended by the coating manufacturer.
- E. All weld seams, gaps, edges, bolts and difficult areas to coat must receive a stripe coat. Stripe coat must be a contrasting color. Stripe coat may be applied with intermediate or finish coating, but must be applied prior to the installation of the finish coat.
- F. Contractor must apply each coat at the rate and in the manner specified by the coating manufacturer, except as may be modified herein. If material has thickened or must be diluted for application, coating must be built up to achieve the dry film thickness as specified for each coat of the complete system.
- G. Maximum and minimum DFT must be per the supplied coating manufacturer's printed requirements and as required by this Section. DFT will be measured per SSPC-PA 2, Level 2 with an allowable measurement of spot DFT of:
 1. Minimum DFT, as specified.
 2. 120 percent of maximum DFT specified.

- H. Contractor and painting technicians are responsible for the application of coating system and must have current applicator certifications from the coating manufacturer. Submit certifications with coating submittal.
- I. Coatings which have an expired shelf or pot life may not be used and must be removed from the jobsite.
- J. Coating must be applied by skilled workmen and must be brushed out or sprayed evenly, without runs, crazing, sags, or other blemishes.
- K. Sand between coats to remove over spray and dry fall.
- L. Apply the first coat to the surface, including cutting in around edges, before the second coat is applied. The second coat and any successive coats must not be applied before notifying the Owner's field representative and obtaining approval. Each coat must be tested before the successive coat is applied.
- M. The coating curing period must be adjusted to compensate for less than adequate weather conditions, as recommended by the coating manufacturer, for complete curing of the entire coating system. The full curing time recommended by the manufacturer must be provided.
- N. Coating must be continuous and must be accomplished in an orderly manner to facilitate proper inspection control.
- O. Where a roller or brush is used to apply the coating, additional coats may be necessary to achieve the recommended dry film thickness and/or to achieve total coverage of the underlying surface. Coated surfaces must be totally free of all roller nap, roller marks, brush bristles and brush marks.
- P. When using conventional coating spray equipment for coating operations, effective oil and water separators combined with after coolers or deliquescent dryers must be used in compressed air lines to remove detrimental oil and moisture from the air. Separators must be placed as far as practical from the compressor. Compressors must be tested periodically by the Contractor for oil and water contamination of compressed air. Testing must follow ASTM D4285 "Standard Test Method of Indicating Oil and Water in Compressed Air." All compressor units found to produce unacceptable amounts of oil and or water, as determined by results of ASTM D4285 test data must be replaced with a compressor that is acceptable.
- Q. For porous surfaces, such as concrete or masonry, a prime coat may be thinned to provide maximum penetration and adhesion. The type and amount of thinning must be determined by the coating manufacturer and is dependent on surface density and type of coating.
- R. Concrete and Steel Floors and Walks, including Bulk Storage Areas:
 - 1. Provide non-skid surface in walkway areas and on floors.
 - 2. Contractor is to include non-skid additive such as aluminum oxide to coatings or may use 50 mesh dry wash silica sand broadcasted into the film and back rolled to encapsulate as recommended by the coating manufacturer.
 - 3. Contractor is to provide a test area to confirm with Owner that the non-skid surface is adequate and consistent. Contractor must modify method or products used as required to provide an acceptable surface.

530.13 Field Quality Control

- A. Field Tests: Make wet film tests during painting operations to assure proper thicknesses of coating are being applied. After each coat has been applied, test the paint film thickness with a nondestructive, magnetic type thickness gauge. The total dry-film thickness for each coat must be per Paragraph [3.09.G]. Apply additional coats until the specified thickness is reached or exceeded.
- B. Holiday Testing:
 - 1. Holiday testing must be performed in accordance with NACE SP0188 or ASTM D5162 for steel substrates and ASTM D4787 for concrete substrates.
 - 2. Test the entire surface of coated steel and piping in moderate or severe environments, as determined by the Engineer, with a holiday detector. For thickness between 10 and 20 mils (250 to 500 microns) a non-sudsing type wetting agent, as recommended by the holiday detector manufacturer, must be added to the water prior to wetting the detector sponge.
 - 3. Holiday detect coatings in excess of 20 mils with high voltage holiday testers as recommended by the coating manufacturer.
 - 4. Mark and repair failures in accordance with the manufacturer's printed instructions, then retest failure areas. No failures or other irregularities will be permitted in the final coats. Areas containing holidays must be repaired until tests indicate no holidays.

530.14 Protection Of Surfaces Not To Be Painted

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted.
- B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
- D. Mask openings in motors to prevent paint and other materials from entering the motors.

530.15 Damaged Coatings, Pinholes, And Holidays

- A. Feather edges and repaired in accordance with the recommendations of the paint manufacturer.
- B. Repair fusion bonded coatings to be as recommended by the original applicator. Applicator must provide liquid repair kits for this purpose as recommended by the coating manufacturer.
- C. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

530.16 Unsatisfactory Application

- A. If the item has an improper finish color, or insufficient film thickness, clean and topcoat surface with specified paint material to obtain the specified color and coverage. Obtain specific surface preparation information from the coating manufacturer.
- B. Hand or power sand visible areas of chipped, peeled, or abraded paint and feather the edges. Follow with primer and finish coat in accordance with the Specifications. Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required.
- C. Evidence of runs, bridges, shiners, laps, or other imperfections are cause for rejection.
- D. Repair defects in coating system per written recommendations of coating manufacturer.
- E. Leave all staging up until the Engineer has inspected the surface or coating. Replace staging removed prior to approval by Engineer.

530.17 Coating Inspection

General:

- A. All coats will be subject to inspection by the Engineer and the coating manufacturer's representative.
- B. Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.
- C. Give particular attention to edges, angles, flanges, and other areas where insufficient film thicknesses are likely to be present and ensure proper millage in these areas.

Coating Thickness Testing:

- A. Owner's representative may conduct coating thickness testing as necessary and without limitation.
- B. Measure coating thickness specified in mils with an electronic type dry film thickness gauge.
- C. Check each coat for the correct millage.
- D. Tests for concrete coating thickness may be taken using a Tooke Gauge or gauge approved for testing coatings over concrete substrates. Contractor must repair coating after thickness testing, if required.
- E. Coating Continuity (Holiday) Testing: Owner's representative will witness holiday testing performed by the Contractor.

Cleaning And Adjusting:

- A. Promptly remove trash and debris resulting from painting operation from the Site. Remove drop cloths, masking tapes and other protective coverings. Remove paint spills, splatters, overlap of paint from adjacent material and other defects. Spot paint nicks and other defects.
- B. Remove paint containers and waste products. Thoroughly clean paint storage rooms, removing spilled paint from walls and floors.

- C. Damages due to over spray on buildings, vehicles, trees, or other surfaces not specified to be painted would be the responsibility of the Contractor.

530.18 Schedule

- A. Protective coatings must be applied in accordance with the following paint schedule. If additional or alternate primers, etc. are recommended by the coating manufacturer for any of the coatings specified, they must be provided at no additional cost to the Owner to provide a complete and compatible coating system, as approved by the Engineer.

PROTECTIVE COATINGS PAINT SCHEDULE

System	Application	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
No. 1	Submerged Metal - Potable Water All metal surfaces new and existing below a plane 1 ft. above the maximum liquid surface, metal surfaces above the maximum liquid surface which are a part of the immersed equipment, concrete embedded surfaces of metallic items under submerged or buried conditions, such as wall pipes, pipes, wall or floor sleeves, access manholes, gate guides and thimbles, and structural steel. Not to be used for potable water storage tanks. All coatings must be NSF 61 certified.	SSPC-SP 1 SSPC-SP 10 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05	TYPE H - Epoxy-Polyamide	1	4.0
			TYPE H - Stripe Coat TYPE H - Epoxy-Polyamide	2	4.0
Total Minimum Dry Film Thickness					12.0 mils
No. 2	Above-Grade Interior/Exterior Steel and D.I. Piping Non-Immersion/Non-Corrosive Environment All metal surfaces new and existing, such as inside pump station buildings, exterior piping and valves, exterior structural steel, etc. Application Notes: 1. Proposed piping and valves may be provided with factory applied prime coat(s), with fusion bonded epoxy or Type H epoxy. For damaged factory applied coatings spot prime with Epoxy Mastic. Provide application of Type C and Type M coatings in the field. 2. Proposed Field Coated and Existing Previously Coated Piping and Valves: Prepare as indicated and provide full coat of Epoxy Mastic and continue with stripe, intermediate and top coat as indicated.	For New Piping and Valves: SSPC-SP 1 SSPC-SP 6 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05 For Previously Coated Piping and Valves: SSPC-SP 1 SSPC-SP 3 NAPF 500-03-01 NAPF 500-03-03	TYPE N - Epoxy Mastic	1	5.0
			TYPE C - Penetrating Epoxy Pre-Primer TYPE M - Stripe Coat Type M - HS Epoxy Siloxane	1	2.0
Total Minimum Dry Film Thickness					5.0-7.0
Total Minimum Dry Film Thickness					12.0 mils
No. 3	Concrete Floor Surfaces/Bulk Storage Areas of Chemical Storage Areas All new and existing interior concrete floors, such as inside pump station buildings and chemical storage	SSPC-SP 13 ICRI CSP 3-5	Primer - As Needed TYPE L - Epoxy/Vinyl Ester	1	35 mils

System	Application	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
	areas. All coatings must include skid-resistant additives. Coatings provided must be resistant to sodium hypochlorite (12.5%). Application Notes: Provide epoxy primer as required by coating manufacturer to address outgassing and resurfacing as required.				
Total Minimum Dry Film Thickness					35.0 mils
No. 5	High-Temperature Surfaces Interior and exterior surfaces of surfaces with temperatures from 200 to 400 deg F.	SSPC-SP 1 SSPC-SP 10	TYPE J - Silicone Aluminum	2	1.0
Total Minimum Dry Film Thickness					2.0 mils
No. 6	Above-Grade Interior and Exterior PVC Pipe Exterior surfaces PVC piping.	SSPC-SP 1 Light Sanding	TYPE B - Epoxy-Polyamide Primer TYPE I - Aliphatic Polyurethane Enamel	1 1	3.0 3.0
Total Minimum Dry Film Thickness					6.0 mils
No. 7	Metal Piping and Valves – Immersion in Wet Wells Moderate to Severe Environment (Non-Potable) Exterior/interior surfaces of submersed valves & pumps, penstocks, piping, sewer interceptors,	SSPC-SP 1 SSPC-SP 6 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05	Type Q - 100% Solids Epoxy for Wastewater	1-2	40.0

System	Application	Surface Prep	Product Type	No. of Coats	DFT/Coat (mils)
	wastewater vessels, settling tanks and buried piping connecting to them for severe conditions with exposure to H₂S gas, including wastewater digesters, etc. Application Notes: Coating may be applied in two coats, as recommended by the manufacturer.				
Total Minimum Dry Film Thickness					40.0 mils
No. 8	New and Existing Metal Piping and Valves within Vaults and Under Insulation Moderate to Severe Environment All metal surfaces new and existing that will be installed in areas where temporary submerged conditions can occur, such as within vaults and for piping and valves covered with insulation. Application Notes: 1. Proposed piping and valves may be provided with factory applied prime coat(s), with fusion bonded epoxy or Type H epoxy. For damaged factory applied coatings spot prime with Epoxy Mastic. Provide application of Type C and Type M coatings in the field. 2. Proposed Field Coated and Existing Previously Coated Piping and Valves: Prepare as indicated and provide full coat of Epoxy Mastic and continue with stripe, intermediate and top coat as indicated.	For New Piping and Valves: SSPC-SP1 SSPC-SP6 NAPF 500-03-01 NAPF 500-03-04 NAPF 500-03-05 For Previously Coated Piping and Valves: SSPC-SP1 SSPC-SP3 NAPF 500-03-01 NAPF 500-03-03	TYPE N – Epoxy Mastic TYPE C – Penetrating Epoxy Pre-Primer TYPE G - Stripe Coat TYPE G – Epoxy-Polyamide	1 1 2	4.0 2.0 4.0
Total Minimum Dry Film Thickness					12.0 mils

530.19 Measurement and Payment

There is no separate payment for the supply and installation of coatings on any construction or installation by the Contractor. The Contractor shall consider all labor, equipment, materials, time, incidentals, and other items required for installation of coatings subsidiary to the item for which they are part.

End