LADERA SITE GRADING / RETAINING WALLS

Specifications

July 2024

PAPE-DAWSON ENGINEERS

Transportation | Water Resources | Land Development | Surveying | Environmental

LADERA SITE GRADING / RETAINING WALLS

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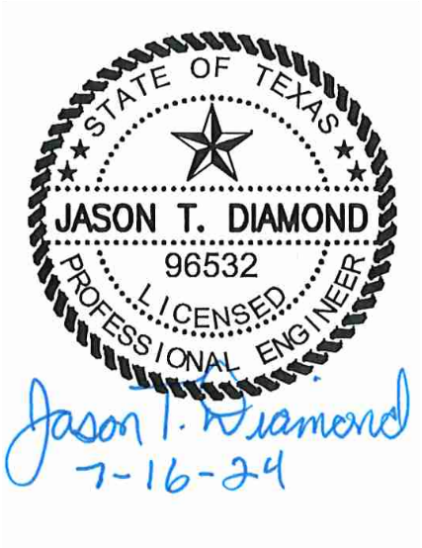

July 2024

SECTION 00 0110

TABLE OF CONTENTS

R. 01 5500 - Vehicular Access and Parking
S. 01 5713 - Temporary Erosion and Sediment Control
T. 01 5713.10 - Spill Response
U. 01 5813 - Temporary Project Signage
V. 01 7000 - Execution and Closeout Requirements
W. 01 7123.10 - Field Engineering
X. 01 7800 - Closeout Submittals
Y. 01 7836.10 - Warranties and Bonds

2.02 Division 02 -- Existing Conditions

A. 02 3000 - Subsurface Investigation
B. 02 4100.10 - Site Demolition

2.03 Division 03 -- Concrete

A. 03 0100 - Maintenance of Concrete
B. 03 1000 - Concrete Forming and Accessories
C. 03 2000 - Concrete Reinforcing
D. 03 3000 - Cast-in-Place Concrete
E. 03 3000.10 - Controlled Low Strength Backfill
F. 03 4100 - Precast Structural Concrete

2.04 Division 04 – Masonry

A. 04 0511 – Masonry Mortaring and Grouting

2.05 Division 31 -- Earthwork

A. 31 1000 - Site Clearing
B. 31 1000.10 - Tree Protection
C. 31 2200 - Grading
D. 31 2316 - Excavation
E. 31 2316.13 - Trenching
F. 31 2316.14 - Trench Excavation Protection
G. 31 2323 - Fill
H. 31 3213.16 - Cement Soil Stabilization
I. 31 3700 - Riprap

2.06 Division 32 -- Exterior Improvements

A. 32 1123 - Aggregate Base Courses
B. 32 1313.10 - Concrete Curbs, Gutters and Sidewalks
C. 32 1731 - Steel Guardrail
D. 32 3113 - Chain Link Fences and Gates
E. 32 3223 - Segmental Retaining Walls
F. 32 9219 - Seeding

G. 32 9223 - Sodding

H. 32 9300 - Plants

2.07 Division 33 -- Utilities

A. 33 0273 - Site Concrete Encasement, Cradles, Saddles and Collars

B. 33 4100 - Subdrainage

C. 33 4211 - Stormwater Gravity Piping

D. 33 4213 - Stormwater Culverts

END OF SECTION

SECTION 00 0115

LIST OF DRAWING SHEETS

Sheet#	Sheet Title
C0.00	Cover Sheet
C0.10	General Construction Notes Sheet 1
C0.11	General Construction Notes Sheet 2
C1.00	Overall Site Plan
C1.01	Existing Conditions Plan
C1.02	General Access Plan
C1.02	Geotechnical Boring Plan
C2.00	Storm Water Pollution Prevention Plan
C2.10	Storm Water Pollution Prevention Plan Details
C3.00	Tree Preservation Plan Sheet 1
C3.10	Tree Preservation Plan Sheet 2
C4.00	Dimensional Control Plan
C4.01	Dimensional Control Plan Sheet 1
C4.02	Dimensional Control Plan Sheet 2
C4.03	Dimensional Control Plan Sheet 3
C4.10	Dimensional Control Point Tables
C4.20	Civil Details Sheet 1
C4.21	Civil Details Sheet 2
C5.00	Overall Grading Plan
C5.01	Grading Plan Sheet 1
C5.02	Grading Plant Sheet 2
C5.03	Grading Plan Sheet 3
C5.04	Grading Plan Sheet 4
C5.05	Temporary Concrete Pavement Details
C6.00	Overall Storm Drainage Plan
C6.01	Storm Drain A Plan and Profile
C6.02	Storm Drain B Plan and Profile
C6.03	Storm Drain C Plan and Profile
C6.04	Storm Drain D Plan and Profile
C6.05	Storm Drain E Plan and Profile
C6.10	Storm Drain Details Sheet 1
C6.11	Storm Drain Details Sheet 2
C6.12	Storm Drain Details Sheet 3
C6.13	Storm Drain Details Sheet 4

C6.14 Storm Drain Details Sheet 5
C6.15 Storm Drain Details Sheet 6
C6.16 Storm Drain Details Sheet 7
C6.17 Storm Drain Details Sheet 8
C6.18 Storm Drain Details Sheet 9
C7.01 Sanitary Sewer Line A Plan and Profile
C7.10 Sanitary Sewer Details Sheet 1
C8.00 Pilot Well Casing Extension Detail

END OF SECTION

SECTION 00 1116.10

INVITATION TO BID

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: Ladera Site Grading/Retaining Walls, located in southwest Bexar County, Texas

B. Project Number: 6445-76-002

C. The Owner, hereinafter referred to as Owner: Lennar Homes of Texas, Inc.

D. Owner's Representative: Richard Mott, VP
   1. Corporate Name: Lennar Homes of Texas Land and Construction, LTD
   2. Address: 100 N.E. Loop 410 Suite 1155
   3. City, State, Zip: San Antonio, Texas 78216

1.02 BID OPENING

A. Bid Place
   1. Sealed bids will be received in the office of the Engineer:
      Project Name: Ladera Site Grading/Retaining Walls
      ATTENTION: Lee Niles, P.E.
      c/o Pape-Dawson Engineers
      911 Central Parkway North, Suite 400
      San Antonio, TX 78232
      Phone/Fax: 210-375-9000 / 210-375-9010
      Email: lniles@pape-dawson.com

B. Bid Due Date**: Friday, August 9, 2024, by 2:00 pm local time.**

C. Bid proposals may be submitted by facsimile transmission, mail, email, or in person. All bid proposals submitted by fax transmission or email shall be submitted in original hard copy within two (2) business days of bid opening. Failure to provide an original, printed and signed bid proposal form may be deemed as grounds for rejection of bid by Owner.

D. **Bids will be opened in public and read aloud.**

1.03 REJECTION

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

1.04 DELIVERY OF PROPOSALS

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

1.05 TIME OF COMPLETION

A. Each Bidder shall indicate on his bid proposal form the number of calendar days it 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 Bidders to whom the Contract will be awarded.

END OF SECTION

SECTION 00 1116.20

BID BASIS

PART 1 GENERAL

1.01 PRICING DOCUMENTS

A. The pricing documents are not final drawings and specifications. These documents, together with the Contractor's knowledge of and anticipation of the final requirements, will be the basis for all pricing. It is the Owner's intention to have the Engineer develop final construction documents with the Contractor's review and assistance. The Engineer, however, will make the final decisions during the development of the final documents.

B. The final documents to be developed will be a further refinement and clarification of the existing documents; however, any material or labor required to provide a complete and operable project that is not indicated in these initial documents should be included in this price submittal. Change Orders increasing the Contract amount will be issued only in the event the scope is changed.

C. 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 are not shown in the drawings, or the reverse, shall be provided as if shown or mentioned in both.

END OF SECTION

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

PART 1

1.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of Pape-Dawson Engineers, at 911 Central Parkway North, Suite 400, San Antonio, Texas 78232 **before 2:00 p.m. local standard time on Friday, August 9, 2024. Bids will be opened publicly and read aloud.**

B. Bids submitted after the above time will be returned to the bidder unopened.

C. Submit required Supplements To Bid Forms with the bid documents.

D. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

1.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete the Site Granding and Retaining Walls at the Ladera Water Production Facility in southwest Bexar County, Texas for a Stipulated Sum contract, in accordance with the Contract Documents.

1.03 PROJECT SCOPE

A. Work included in this Project is comprised of site excavation and embankment, import of fill with embankments, site grading, on-site storm drainage system with piping, junction boxes, grate inlets, curb inlets, concrete paving, security fencing and gates, sanitary sewer piping and manholes, temporary potable water service, segmented retaining walls to heights of 25', tree protection, traffic control, testing and laboratory services, site cleanup and seeding of disturbed areas.

B. The Project is located in in southwestern Bexar County, 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 Bidder's proposed time of completion when reviewing the submitted bids.

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 6445-76-002, as prepared by Pape-Dawson Engineers who is located at 911 Central Parkway North, Suite 400, San Antonio, Texas 78232, and with contents as identified in the Table of Contents.

2.03 AVAILABILITY

A. Complete sets of Bidding 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 Bidding Documents.

C. Bid documents may be obtained at Pape-Dawson Engineers, 911 Central Parkway North, Suite 400, San Antonio, Texas 78232, (210) 375-9000. All requests shall be made to Lee Niles, PE, at lniles@pape-dawson.com, or by phone, letter or fax.

D. Subcontractors, vendors and/or suppliers requesting Drawings and Project Manuals must obtain them from Contractor.

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 Bidding Documents and the Project Site to familiarize themselves with existing local conditions under which the work is to be performed.

B. Bidders shall carefully examine the Bidding Documents to verify that they agree with the Table of Contents in the Project Manual, the Index of Drawings Sheet on the Drawings, and the Cover Page(s) of all Addenda. Bidders shall be responsible for obtaining any pages or sheets which may have been inadvertently left out during the bidding process.

C. All 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 or completeness thereof. All 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.

2.05 INQUIRIES/ADDENDA

A. Bidders shall promptly notify the Engineer in writing of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents, or of the site and local conditions. Conflict in documents not brought to the attention of the Engineer during bidding shall be deemed to be provided at no additional cost.

B. Submit all questions regarding clarification or interpretation of Bidding Documents to the office of the Engineer, Pape-Dawson Engineers, 911 Central Parkway North, Suite 400, San Antonio, Texas 78232, Attn: Lee Niles, P.E., (210) 375-9000 by fax (210) 375-9010 or email lniles@pape-dawson.com. **Final date to submit questions will be Tuesday, August 6, 2024 at 5:00 pm.**

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 Bidders in the form of an Addendum, Bid Clarification or as General Information.

D. Addenda may be issued during the bidding period. All Addenda will 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 5 days before date set for receipt of bids. The reply will be in the form of an Addendum, Bid Clarification, or as General Information, a copy of which will be forwarded to Bidders .

2.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Requests for substitution of materials, products or equipment will be acknowledged and accepted from authorized Bidders only. All received requests from potential subcontractors, vendors, manufacturers, etc. will be refused.

B. Where the Bid Documents stipulate a particular product, substitutions may be considered up to 5 days before receipt of bids.

C. Substitute products will not be considered if submitted as an attachment to the Bid Form. Approval to submit substitutions prior to submission of bids is required.

D. When a request to substitute a product is made, the Engineer may approve the substitution and if approved, will issue an Addendum to all Bidders.

E. Approval of substitute materials, products or equipment by the Engineer will not be considered as acceptable justification for extensions of Contract Time, Contract Costs, or adjustments to Project Schedule.

F. Each submission shall to the Engineer provide sufficient information to determine acceptability of such products. The Engineer's decision on suitability of substituted items shall be final.

G. Provide complete information on required revisions to other work to accommodate each proposed substitution.

H. 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 Engineer at the following address and phone number in order to arrange a date and time to visit the project site: Pape-Dawson Engineers, 911 Central Parkway North, Suite 400, San Antonio, Texas 78232, Attn: Lee Niles, P.E., (210) 375-9000.

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 knowledge and understanding 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, as noted in these bidding documents.

E. The Contractor shall not enter or have access to the site in order to perform the work without first having given timely written notice to the Owner so that the necessary arrangements may be made to enter or have access.

3.02 PREBID CONFERENCE

A. A pre-bid conference has been scheduled for **Tuesday, July 30, 2024 at 2:00 pm** at the location of Pape-Dawson Engineers, 911 Central Parkway North, Suite 400, San Antonio, Texas 78232.

The Pre-Bid conference will also be accessible via Microsoft Teams. Specific information on remote access to be provided.

B. All general contract bidders are invited.

C. Representatives of Engineer and Owner will be in attendance.

D. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bidders as appropriate.

3.03 BASIS OF BIDS

A. Bids shall include all Unit Price costs as indicated by the Contract Documents and Bid Form. Unit prices are requested for the purposes of establishing costs for additional work and to evaluate the bids. 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.

B. Contractor is to perform an independent quantity take-off for all lump sum bid items 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.

C. All bid items where pricing per unit of measure is requested, are provided for development of bid proposals to the Owner. It is the intent of the Contract Documents to maintain and track all unit price item quantities through construction. A summary of the increases/decreases of individual quantities will be adjusted in a final Change Order prior to Project Closeout.

D. Bids shall include all Alternate costs as indicated by the Contract Documents and Bid Form.

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 will be included as part of the Contract Documents.

3.05 UNIT PRICES

A. Authorized work, done in addition to that indicated by the Contract Documents, 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 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.

3.06 BIDS

A. All bids shall be submitted as specified in Section 00 1116.10, paragraph 1.02.C. Bids shall be made on unaltered Bid Forms furnished by the Engineer. No oral, voice mailed, or personal Proposals will be considered. All blank spaces shall be properly filled in by typewriter or manually in ink.

B. Where so indicated by the make-up 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. Original typed sheets shall be submitted, signed in longhand below the typed name of the person authorized to bind the Bidder to a Contract.

E. 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.

F. 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, a general description of the work to be performed by each and an estimated dollar value of each subcontract.

G. 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.

H. Failure to submit a Bid in the form requested, or the inclusion of conditions, limitations or provisions distorting the intent of the Bid Documents, will render the Bid irregular and subject to rejection.

PART 4

4.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be required to submit written evidence of financial position, previous experience, and current commitments, license to perform work in the City of San Antonio.

4.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner reserves the right to reject a proposed subcontractor, supplier, manufacturer, vendor for 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 in Section 00 1116.10, paragraph 1.02.C.**

B. Submit one copy of the executed offer on the Bid Forms 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: (Owner's Name; Project Name) c/o: **Pape-Dawson Engineers, Inc. – Lee Niles, P.E., 911 Central Pkwy North, Suite 400, San Antonio, Texas 78232**.

D. If the bid is sent by email, it shall be sent to Lee Niles, PE at lniles@pape-dawson.com, and shall include the full bid form, **and all related documents.** Hard copies of all the bid documents shall be mailed or delivered to Lee Niles and received within 2 business days.

E. Improperly completed information, irregularities in security deposit, may be a justification 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, unless the award of Contract has been delayed more than thirty (30) days.

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. Modification of Bids shall be in writing over the signature of the Bidder. Written confirmation over the signature of Bidder must have been mailed and postmarked on or before the date and time set for receipt of Bids; it shall be so worded as not to reveal the amount of the original Bid.

D. 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 will invalidate the bid.

D. Bids are by invitation, only from selected bidders. Bids from unsolicited bidders will be returned.

5.04 CONSIDERATION OF BIDS

A. Properly identified Bids received on time will be opened in public and read aloud.

B. Owner reserves the right to reject any or all bids submitted, to enter into negotiations with any bidder hereunder; to alter the Contract by agreement in writing with the successful bidder; or to take such other steps as may insure its complete freedom of action in selecting the successful bidder, all without any obligation or liability whatsoever to any bidder hereunder.

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 Bidding 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 Alternatives, 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.

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 Bid. 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 fourteen (14) days, execute the necessary bonds and sign the Agreement. Failure to do so may be considered abandonment by the Owner.

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.

PART 6

6.01 SECURITY DEPOSIT

A. Bid Bond will be required for this project.

B. Performance and Payment Bonds will be required for 100% of the cost of the project. Bonds shall be in a format acceptable to the Owner.

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 - $1,000,000.
      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 $1,000,000 per occurrence, $2,000,000 aggregate, in excess of the underlying coverages listed above.
5. Additional Requirements
   a. Owner and Engineer and their identified subconsultants 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 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 FEES FOR CHANGES IN THE WORK

A. Include in the Bid Form, the overhead and profit fees on own Work and Work by subcontractors, applicable for Changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based for each item listed on the Bid Proposal Form.

6.06 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 any or all of the alternatives at the Owner's discretion. 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 thirty (30) days after the bid closing date.

7.02 ACCEPTANCE OF OFFER

A. Owner reserves the right to reject any or all bids submitted, to enter into negotiations with any bidder hereunder; to alter the Contract by agreement in writing with the successful bidder; or to take such other steps as may insure its complete freedom of action in selecting the successful bidder, all without any obligation or liability whatsoever to any bidder hereunder.

B. After acceptance by Owner, Owner will issue to the successful bidder, a written Notice of Award, and notification that a contract for the Project will be delivered for review and execution by the successful Bidder.

END OF INSTRUCTIONS TO BIDDERS

SECTION 00 3100

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 but will not be part of Contract Documents, as follows:

B. Geotechnical Report: Entitled "Geotechnical Engineering Report, Ladera Water Production Facility, PSI Project No. 0312-3095, dated July 1, 2024".

1. Original copy is available for review at the office of Pape-Dawson during normal business hours and as a downloaded document to interested bidders.
2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations and site construction.
3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
4. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.
5. Bidders may prepare additional subsurface investigations at their costs with coordination through Pape-Dawson.

D. Existing Conditions are noted on the projects drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

3.01 OBTAINMENT OF PERMITS

END OF SECTION

PRICE PROPOSAL

OWNER RESERVES THE RIGHT TO ACCEPT THE OVERALL MOST RESPONSIBLE PROPOSAL.

The Respondent offers to construct the Project in accordance with the Contract Documents for the contract price, and to complete the Project within _____ calendar days after the start date, as set forth in the Authorization to Proceed. **The Respondent understands and accepts the provisions of the contract Documents relating to liquidated damages of the project if not completed on time.**

Complete the additional requirements of the Price Proposal which are included on the following pages.

Statement on President's Executive Orders

Has your firm previously performed work subject to the President's Executive Orders Numbers 11246 and 11375 or any preceding similar executive orders (Numbers 10925 and 11114)? Yes ☐ No ☐

Item No.	Description	Unit	Quantity	Unit Price	Total Price
1	Misc. TPDES/SWPPP erosion control practices – including silt fencing for project, maintain permits, submit NOI, NOT, complete	LS	1	$_____	$_____
2	Concrete drive per City of San Antonio, complete	SY	700	$_____	$_____
3	Compacted base, 8" complete	SY	6,425	$_____	$_____
4	Concrete Curb per City of San Antonio, complete	LF	455	$_____	$_____
5	Guardrail, per TxDOT Item 540, with painting, complete	LF	1,380	$_____	$_____
6	Excavation, estimated at 20,410 cyd, complete	LS	1	$_____	$_____
7	Embankment, including import of select fill materials estimated at 71,740 cyd, complete	LS	1	$_____	$_____
8	Segmented Retaining Wall with stabilization, drains, backfill, estimated at 1,407 feet, complete	LS	1	$_____	$_____
9	12" Storm sewer piping, per City of San Antonio CIMS, complete	LF	340	$_____	$_____
10	18" Storm sewer piping, per City of San Antonio CIMS, complete	LF	46	$_____	$_____
11	24" Storm sewer piping, per City of San Antonio CIMS, complete	LF	1,215	$_____	$_____
12	6" Concrete channel along retaining wall, complete	SY	307	$_____	$_____
13	3' x 3' precast grate inlet, per City of San Antonio CIMS, complete	EA	2	$_____	$_____
14	3' x 3' Junction Box per City of San Antonio CIMS, complete	EA	2	$_____	$_____

Item No.	Description	Unit	Quantity	Unit Price	Total Price
15	4' x' 4' Junction Box, per City of San Antonio CIMS, complete	EA	9	$_____	$_____
16	4' x 4' 4-way inlet box, per City of San Antonio CIMS, complete	EA	1	$_____	$_____
17	5' x 5' Junction Box, per City of San Antonio CIMS, complete	EA	2	$_____	$_____
18	Pre-cast Type "C" concrete curb inlet, 10' opening, per City of San Antonio, complete	EA	3	$_____	$_____
19	6" concrete pad at curb inlet, complete	EA	2	$_____	$_____
20	6" PVC Cleanout	EA	2	$_____	$_____
21	12' Nyoplast Inlet, complete	EA	3	$_____	$_____
22	Precast headwall with security piping, 24" storm drain piping, Per TxDOT complete with rock riprap	EA	1	$_____	$_____
23	Storm sewer rock Riprap, complete	SY	25	$_____	$_____
24	8" PVC Sanitary Sewer piping, per SAWS 848, SDR 26, with excavation, backfill, complete	LF	115	$_____	$_____
25	Standard 4' sewer manhole with drop structure, Per SAWS 852, with excavation, backfill, complete	EA	3	$_____	$_____
26	8" PVC Sewer Cap, SAWS Item 854, complete	EA	1	$_____	$_____
27	Temporary water service for construction and testing, with meter, piping, fittings, etc., complete	ALW	1	$15,000	$15,000
28	Miscellaneous construction permits, inspection fees, etc.	ALW	1	$25,000	$25,000
29	8' Chain link security fencing, with barbed wire topping, fabric, posts, mow strip, etc., per SAWS 845, complete	LF	2,532	$_____	$_____
30	4' Personnel gate for 8' chain link security fencing, manual with posts, locking hardware, mow strip, etc., per SAWS 845, complete	EA	2	$_____	$_____
31	30' manual sliding gate for decorative fencing, with posts, guiding rails, concrete surface, locking hardware, etc., Per SAWS 845, complete	EA	1	$_____	$_____
32	Tree protection, complete	LS	1	$_____	$_____

Item No.	Description	Unit	Quantity	Unit Price	Total Price
33	Traffic control, including lights, barriers, signage, flagmen, etc., complete	LS	1	$_____	$_____
34	Pilot well casing extension with junction boxes, compaction, fill, etc., complete	LS	1	$_____	$_____
35	Site revegetation, hydro-mulch, with temporary irrigation, estimated at 21,165 SY, complete	LS	1	$_____	$_____
36	Bid Bond, complete	LS	1	$_____	$_____
37	Performance and Payment Bonds, complete	LS	1	$_____	$_____
39	Insurance	LS	1	$_____	$_____
39	Item 100 - Mobilization and Demobilization, Max 6% of Subtotal Line Items 1 - 35	LS	1	$_____	$_____

MOBILIZATION AND DEMOBILIZATION LUMP SUM BID SHALL BE LIMITED TO A MAXIMUM 6% OF THE TOTAL SUM OF ITEMS 1-35. IN THE EVENT OF A DISCREPANCY BETWEEN THE WRITTEN PERCENTAGE AND THE DOLLAR AMOUNT SHOWN FOR MOBILIZATION AND DEMOBILIZATION, SAWS RESERVES THE RIGHT TO CAP THE AMOUNT AT THE PERCENTAGE SHOWN AND ADJUST THE EXTENSION OF THE BID ITEM ACCORDINGLY.

TOTAL PROPOSAL PRICE (TO INCLUDE LINE ITEMS 1 – 39)	$

General Notes to bid proposal.

1. Contractor is to perform an independent quantity take-off prior to signing the contract, to verify that the quantities given in the bid proposal are within three percent (3%) 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 three percent (3%), the Contractor shall notify the Engineer forty-eight (48) hours prior to signing the contract.
2. 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 the sum of the unit prices times the estimated quantity of each item shown in the bid form. However, the Contractor shall guarantee himself the accuracy of the quantities shown in the bid form. The 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.
3. TPDES Construction
    a. Commence of Construction:
    b. Initial project clearing will need to be limited to the locations of the proposed temporary SWP3 Best Management Practices (BMP) designed by the engineer. These BMPs may include but are not limited to: Stabilized Construction Exit(s), Silt Fence, Discharge Point Rock Berms/Check

Dams, Trash containment, Temporary Sediment Basins (if applicable), Demarcation of protected site features for example, Wetlands, Environmental Buffers, Caves or Solution Features, and Habitats.

c. Prior to commencement of additional clearing or earth disturbing activities, the proposed BMPs will need to be installed by the Contractor and inspected by a Lennar Representative. The contractor must provide at minimum, 48-hours of notice to Lennar when the BMPs are scheduled to be installed and completed. The Lennar Representative will coordinate with the Land Development Manager to release the project for construction.

d. When the project is located within the Bexar County controlled MS4, the Contractor must provide 48-hours of notice to the assigned Bexar County SWP3 Inspector noted on the Storm Water Quality (SWQ) permit letter.

e. When a Temporary Sediment Basin is required for the project, limited clearing of the proposed basin location and any material borrow areas to construct the Temporary Sediment Basin may occur during the initial BMP installation period. The Temporary Sediment Basin must be completely constructed to Engineer's design. This may include the following.
    1. Construction of the dewatering structure (Riser Pipe or Fair Cloth Skimmer and pump)
    2. Construction of the Emergency Overflow Structure, Installation of a sediment depth marker. Note-Once accessible to appropriate equipment, only the Temporary Sediment Basin berms/slopes shall be temporarily stabilized.

f. General Contractor is to maintain all pollution control measures in effective operating condition throughout the contract period to the extent achievable. To ensure BMPs are operating effectively, and in accordance with the Construction General Permit, Lennar will provide regular and if applicable, post-rain event BMP inspections and inspection reports. The General Contractor will be provided an electronic copy of the BMP inspection report via email. weekly regarding issues with BMPs at the project through the Lennar SWP3 Inspection process. Items noted in the BMP Inspection report must be addressed by the General Contractor as soon as possible, and within 7 calendar days. General Contractor shall provide documentation to the assigned Lennar Land Development Project Manager to include:
    1. Actions taken in response to the BMP inspection report and date(s) the actions were completed or,
    2. Statement of extenuating circumstance as to why an item could not be completed within the 7-day timeframe and proposed scheduled date of completion.

g. Contractor to maintain Spill Response Supplies/Kit at the project location while actively working onsite.

h. When dewatering activities discharge into onsite creeks or rivers, or discharge outside the limits of construction, daily dewatering inspections must be documented in accordance with the 03.05.2023 TCEQ Construction General Permit. Daily reports must be sent to Lennar and the Engineer within 24 hours.

4. Grading: Contractor to field verify and survey the existing site topography and submit information to engineer prior to submitting final bid for verification. No shrinkage or swelling factor is accounted for in the engineering excavation and embankment quantities. Contractor to adjust unit price as he deems necessary to account for shrinkage and swelling.
5. Sewer: Note: Refer quantities to the current San Antonio Water System (SAWS) Standard Specifications for Construction. A SAWS Counter Permit is required. Contractor shall provide proof of trench compaction test results as tested by a Geotechnical Engineer, to comply with SAWS GCP. Cost of first time testing to be paid by owner. Cost of required retesting shall be paid by Contractor.

SECTION 00 4100

BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Lennar Homes of Texas, Inc. (Owner)

1.02 FOR:

A. Site Work/ Retaining Walls Construction at the Ladera Water Production Facility

1.03 DATE: _____

1.04 SUBMITTED BY: (Bidder to enter name and address)

A. Bidder's Full Name: _____

1. Address: _____

2. City, State, Zip: _____

3. Telephone: _____

4. Primary Email Address: _____

5. 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.
6. In submitting this Bid, it is understood that this Bid may not be altered or withdrawn for a minimum of forty-five (45) calendar days, and that the Owner has reserved the right to reject any and all Bids.
7. 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 Bidding Documents related to the work covered by his Bid.

1.06 OFFER

A. Having examined the Place of The Work 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:

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

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 01 2100 - Allowances are included in the Bid Sum.

1.07 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) 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 fourteen (14) days of receipt of Notice of Award or acceptance of this bid.
   2. Furnish the required bonds within fourteen (14) days of receipt of Notice of Award or acceptance of this bid.
   3. Commence work within fourteen (14) days after written Notice to Proceed or acceptance of this bid. Completion time includes fifty-five (55) (see SAWS Table) days for adverse weather conditions.

1.08 CONTRACT TIME

A. If this Bid is accepted, we will complete the Work in [_____] calendar days from Notice to Proceed or acceptance of this bid.

B. Project Schedule – Project Milestones. Bidder to provide summary of key milestones for the project reflecting construction period noted in 1.08 A above. Milestones shall include, at a minimum, the following:

1. Site mobilization, placement of required SWPPP facilities, erosion control methods, tree protection. _____ days
2. Mobilization of equipment to the stie. _____ days
3. Estimated times for excavation and embankments _____ days
4. Anticipated construction of retaining walls _____ days
5. Estimated time for revegetation _____ days

1.09 UNIT PRICES SEE ATTACHED BID FORM

A. See Attached Bid Form

1.10 CHANGES TO THE WORK

A. When Engineer or Owner establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:
   1. _____ percent overhead and profit on the net cost of our own Work;
   2. _____ percent on the cost of work done by any Subcontractor.

B. On work deleted from the Contract, our credit to Owner shall be Engineer-approved net cost plus _____ of the overhead and profit percentage noted above.

1.11 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 _____.
   4. Addendum # _____ Dated _____.
   5. Addendum # _____ Dated _____.
   6. Addendum # _____ Dated _____.
   7. Addendum # _____ Dated _____.

1.12 BID FORM SUPPLEMENTS

A. The following information is included with Bid submission:
   1. Subcontractors LIST – SEE ATTACHED FORM
   2. Unit Prices: SEE ATTACHED BID FORM
   3. Alternates: SEE ATTACHED LIST AND SUMMARY

B. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
   1.
   1 Document 00 4336 - Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.
   2. Document 00 4373 - Proposed Schedule of Values Form identifies the Bid Sum segmented into portions as requested.

C. 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) _____

D. 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) $_____

1.13 BID FORM SIGNATURE(S)

A. The Corporate Seal of
   1. _____
   2. (Bidder - print the full name of your firm)

B. was hereunto affixed in the presence of:
   1. _____
   2. (Authorized signing officer, Title)
      (Seal)
   3. _____
   4. (Authorized signing officer, Title)
      (Seal)

END OF SECTION

SECTION 00 4336

PROPOSED SUBCONTRACTORS FORM

PARTICULARS

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

1.02 (Bidder) _____

1.03 TO (Owner): _____

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

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

LIST OF SUBCONTRACTORS

Number	Firm Name	Area of Work	Estimated subcontract value (4)
1		Field Engineering	**$**
2		Retaining wall design and permitting	**$**
3		Laboratory and testing firm	**$**
4			**$**
5			**$**
6			**$**
7			**$**

END OF SECTION

SECTION 00 4373

PROPOSED SCHEDULE OF VALUES FORM

PART I - GENERAL

1.01 GENERAL

A. Prior to the first application for payment, Contractor shall submit to the Engineer, an expanded and detailed schedule of values which will define labor and material separately for each significant portion of the work to be performed.

B. Upon request of the Engineer, Contractor shall support the values with data which will substantiate their correctness.

C. The Schedule of Values, unless objected to by the Engineer, shall be used only as the basis for the Contractor's Applications for Payment.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Submit schedule on the attached form.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. Follow the table of contents of this Project Manual as the format for listing component items. Identify each line item with the number and title of the respective major section of the specifications.

D. For each major line item list sub-values of major products or operations under the item.

E. For items on which progress payments will be requested for stored materials, break down the value into:
   1. The cost of the materials, delivered and unloaded, with taxes paid.
   2. The total installed value.

F. Submit a sub-schedule for each separate stage of work specified.

G. Submit a sub-schedule of unit costs for Products specified under a unit cost allowance.

H. The sum of all values listed in the schedule shall equal the total Contract Sum.

PARTICULARS

2.01 The following is a Cost Breakdown referenced in the bid submitted by:

2.02 (Bidder) _____

2.03 To (Owner) Lennar Homes of Texas, LLC.

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

ITEM DESCRIPTIONS

3.01 Refer to items listed in Bid Proposal, Section 00 4100.

END OF SECTION

SECTION 00 6113.10

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

LADERA WATER PRODUCTION FACILITY
SITE GRADING AND RETAINING WALLS

LAND BASE MASTER TRADE PARTNER AGREEMENT

BETWEEN

"CONTRACTOR"

Lennar Homes of Texas Land and Construction, LTD
Attn: Richard Mott
100 NE Loop 410, Suite 1155
San Antonio, Texas 78216
Main Telephone: 210.403.6200
richard.mott@Lennar.com

AND

"SUBCONTRACTOR"

[Subcontractor Company Name]
[Attn: _____]
[Subcontractor's State License No.: _____]
[Street Address, Suite Number]
[City, State, Postal Code]
[Main Telephone: _____]
[Email: _____]

SECTION REFERENCES

LIST OF SCHEDULES

LENNAR

LENNAR HOMES OF TEXAS L&C, LTD

LAND BASE MASTER TRADE PARTNER AGREEMENT

CONTRACTOR'S STATE LICENSE No: _____

DIVISION OFFICE: San Antonio

CONTRACT NO.: _____

THIS LAND BASE MASTER TRADE PARTNER AGREEMENT (hereinafter referred to as the "Agreement"), is made and entered into on [DATE] by and between Lennar Homes of Texas Land and Construction, LTD whose address is 100 NE Loop 410, Suite 1155, San Antonio, Texas 78216, telephone number 210.403.6200 ("Contractor") and [SUBCONTRACTOR COMPANY NAME], whose address is [SUBCONTRACTOR ADDRESS], telephone number [SUBCONTRACTOR TELEPHONE] and ("Subcontractor").

1. SCOPE OF WORK: Subcontractor shall provide labor, materials, equipment, tools, machinery, transportation, fuel, power, light, heat, telephone, water, sanitary facilities, permits, certificates, bonds, supplies, facilities, incidentals and other materials and services as required for the prompt and efficient execution of the duties under such terms and conditions as Contractor shall deem necessary, as provided herein and as more particularly described in the "Scope of Work" included as Exhibit "A" (or otherwise provided in writing to Subcontractor) to one or more work agreements (each, a "Work Agreement") for a project (each a "Project" hereunder). Subcontractor shall commence such Work, as defined in Section 1.4, only and upon receipt by Subcontractor of a fully executed Work Agreement for a Project, including completed exhibits thereto and a "Notice to Proceed," in a form substantially as set forth in Schedule "2," or as otherwise provided in writing to Subcontractor. Subcontractor agrees, and all Work, as defined below, shall be accomplished pursuant to the pricing ("Pricing Schedule") set forth in Exhibit "B" to the Work Agreement, or otherwise provided in writing to Subcontractor, and any supplemental Pricing Schedule issued by Contractor to Subcontractor pursuant hereto, when completed and executed by Subcontractor and countersigned by Contractor. The Work Agreement shall be substantially in the form of Schedule "1," and may contain other terms and conditions which shall become a part of this Agreement, but only with respect to the particular Project covered by such Work Agreement.

1.1 PROJECT NAME. The Project's name is The Ladera Water Production Facility Edwards Pilot Test Well as set forth in each Work Agreement.

1.2 PROJECT LOCATION. Each Project's address is 3528 Millbrook Way, San Antonio, Texas and located in southwest Bexar County within the Ladera Development located approximately 2.25-miles north of the intersection of US Hwy 90 and SH 211 in Southwest Bexar County as set forth in each Work Agreement as Exhibit "C" thereto.

1.3 PROJECT OWNER. The Owner of the Project ("Owner"), and any construction lender, are as set forth in each Work Agreement. The term "Owner" and "Contractor" shall mean Lennar Homes of Texas L&C, LTD.

1.4 SUB-SUBCONTRACTOR. Unless otherwise provided, the term "Sub-subcontractor" shall include all persons or entities of all tiers, whether contracting directly with Subcontractor, or any person acting by, through or under Subcontractor, that are providing labor, materials, equipment, supplies, and/or supervision (including all suppliers) to satisfy the requirements of Subcontractor's Scope of Work as defined in a Work Agreement ("Work"). Subcontractor shall keep any Sub-subcontractors informed of the requirements of this Agreement. Subcontractor shall not employ any Sub-subcontractor or other party that is to furnish any principal item of material or equipment, whether initially or as a substitute, against whom Contractor has any reasonable objection. If Contractor does not object in writing to any Sub-subcontractor or other party listed in Subcontractor's bid for the Work prior to the giving of the notice of award, each Sub-subcontractor and other party so listed shall be

deemed to be acceptable to Contractor. The list of Subcontractor's proposed Sub-subcontractors shall be attached to the Work Agreement as Exhibit "D". Acceptance of any Sub-subcontractor or other party by Contractor shall not constitute a waiver of any right of Contractor to reject defective or nonconforming Work or constitute a warranty or representation of any nature with respect to such party. Without the prior written consent of Contractor, Subcontractor shall make no substitution for any Sub-subcontractor or other party that has been accepted by Contractor as provided above. If Subcontractor requests Contractor's permission to substitute a Sub-subcontractor previously approved by Contractor, Subcontractor acknowledges and agrees that the Contractor may, prior to its approval of any requested substitution, investigate the reasons for the substitution (including but not limited to, contacting the Sub-subcontractor who Subcontractor desires to terminate).

1.5 PERFORMANCE OF THE WORK. Subcontractor shall furnish all labor, materials, equipment, supplies, supervision and all other things necessary to timely and properly perform the Work in a good and workmanlike manner, free from defects in workmanship or materials, acceptable to Contractor, and in strict accordance with (i) the plans and specifications set forth in the Work Agreement as Exhibit "E" thereto or otherwise, (ii) any applicable manufacturer's specifications, recommendations or requirements, (iii) applicable laws (including environmental laws), industry standards, codes, ordinances, or other rules or regulations, and (iv) the requirements of Contractor's overall Construction Schedule. Subcontractor guarantees the availability of all labor, equipment, and materials necessary to complete the Work in strict accordance with Contractor's Construction Schedule, as defined below, and shall diligently and continuously perform the Work until final acceptance by Contractor, any requisite governmental authority, and any applicable homeowners' or community association. Subcontractor shall be solely responsible to pay for all labor, salaries, materials, tools, equipment, supplies, state, federal, local and all other applicable sales, use, income or other taxes of any type or nature, transportation, storage facilities, offices, telephones, other overhead, shop drawings, supervision, temporary or permanent facilities and all other things necessary for the full and complete performance of the Work addressed in this Agreement, the Work Agreement(s), and, if applicable, any change orders or amendments thereto. Subcontractor shall secure and pay for all permits and governmental fees, licenses, and inspections, to the extent necessary, for the proper execution and completion of Subcontractor's Work. Subcontractor shall perform the Work in a manner which maintains free access to all fire hydrants, unless and until Subcontractor receives written permission from the applicable fire protection districts or fire departments to obstruct such access. Subcontractor shall cooperate with Contactor in obtaining final approval of the Work by any requisite governmental or quasi-governmental authority, including public utility companies, or homeowners' or community association. No substitutions shall be allowed in the performance of the Work unless expressly approved by Contractor in writing. Subcontractor shall provide Contractor with an approved set of as built plans within ten (10) days of acceptance of the Work by the applicable governmental authority.

1.6 INSPECTION AND INVESTIGATION. Subcontractor shall fully and completely investigate and study (i) the Project/Job Site (as set forth in each Work Agreement), (ii) the plans and specifications, (iii) any manufacturer's specifications, and (iv) all other conditions that may affect the Work. By executing a Work Agreement, Subcontractor represents that it has noted no deficiencies or problems with the applicable Project/Job Site, the plans and specifications, the manufacturer's specifications, or any other conditions which would impact its ability to perform the Work in accordance with the requirements of such Work Agreement. If Subcontractor subsequently discovers any discrepancies between the plans, specifications, manufacturer's specifications, physical conditions, or any errors and omissions in the plans or specifications or in the layout as given that might affect the Work, Subcontractor shall immediately notify Contractor in writing. Any Work performed by Subcontractor relating to such discrepancy, error or omission without Contractor's written approval shall be done at Subcontractor's sole risk. Prior to ordering materials or performing the Work, Subcontractor shall verify that the materials are adequate for the performance of the Work, and that all measurements or conditions relevant to Subcontractor's Work are acceptable. No extra charge or compensation shall be allowed on account of differences

between actual dimensions or conditions, and the measurements and conditions which may be found as indicated in the plans and specifications. The soils and geology reports, investigations, or borings available to Subcontractor were prepared by third parties and made only for the purpose of study and design. Contractor does not warrant or guarantee, either expressly or impliedly, the sufficiency or accuracy of the reports or investigations or borings which have been made, or any conditions that exist throughout a particular Project/Job Site. Subcontractor agrees to undertake the Work pursuant to each executed Work Agreement subject to all site conditions as they now exist or may arise.

1.7 DEFECTIVE WORK. Subcontractor is responsible, at its sole cost, for promptly repairing or replacing any defective Work noted by Contractor or any third-party inspectors. Subcontractor shall provide Contractor with an itemized construction inspection checklist in a form approved by Contractor that Subcontractor will use to verify completion and workmanship of the Work required under each Work Agreement. The failure of Contractor, a third party inspector and/or the applicable governmental inspecting authority to identify any defects in the applicable Work during any inspection shall not relieve Subcontractor of its responsibility to perform the Work in accordance with the requirements of this Agreement and the applicable Work Agreement. Contractor, the third party inspector and/or the applicable governmental inspecting authority shall be the sole judge of the adequacy of the repairs made to fix defective Work. If Subcontractor covers any Work prior to Contractor's, the third party inspector's, and/or the applicable governmental inspecting authority's inspection of the Work, then Subcontractor shall be responsible for the cost of uncovering or removal and replacement of the Work to allow Contractor's inspection. Subcontractor shall correct all items noted as needing correction within forty-eight (48) hours of receipt of Contractor's notice.

1.8 CONSTRUCTION SCHEDULE/CONTRACT COMPLETION DATE. The Work to be performed pursuant to this Agreement and each applicable Work Agreement shall commence on the date specified in the fully executed Work Agreement and Notice to Proceed. Subcontractor shall attend preconstruction meetings with Contractor and shall prepare a construction schedule ("Construction Schedule") which depicts in detail the sequence and timing of all significant aspects of the Work to be performed pursuant to each Work Agreement, including, without limitation, starting and completion dates of all portions of the Work, for review and approval by Contractor. The approved Construction Schedule for such Work shall be, when approved by Contractor, attached to the applicable Work Agreement as Exhibit "F". Subcontractor shall diligently and continuously perform the Work without delay and/or interruption to its completion within the time allotted in the Construction Schedule ("Contract Completion Time"), on or before the date set forth in the Construction Schedule for final completion of the Work ("Contract Completion Date"). Subcontractor shall require at least one authorized representative to attend regular team meetings with Contractor and other appropriate consultants to review proposed Work, coordinate work schedules and resolve any conflicts or remaining design issues associated with the Work. Subcontractor shall deliver to Contractor the Construction Schedule within five (5) working days after delivery of an executed Work Agreement by Contractor to Subcontractor. Subcontractor shall comply with the deadlines and schedules established in the Work Agreement and by Contractor, and shall prosecute the Work with diligence and with adequate labor, equipment, and materials to satisfy Subcontractor's progress requirements and so as to not delay the work of other subcontractors. Subcontractor shall cooperate and coordinate its Work with Contractor and all other subcontractors. Subcontractor shall provide written weekly updates to Contractor which specifically detail the actual sequence and timing of the Work compared to the Construction Schedule. Subcontractor's failure to provide written weekly updates to Contractor shall be considered a material breach of this Agreement.

1.8.1 WORKING DAY DEFINED. A "working day" is defined hereunder as any day other than (i) Saturday or Sunday; (ii) a federal holiday; (iii) any day Subcontractor is prevented from working during the first five (5) hours of the working day with at least sixty percent (60%) of the normal workforce due to causes beyond Subcontractor's control.

1.8.2 WORK DELAYS. If Subcontractor is delayed in the performance of the Work by any act or neglect of Contractor, or by an employee, agent or representative of Contractor, or by changes ordered in the Work not caused by or resulting from the default, negligence or collusion on the part of Subcontractor, or if Subcontractor is delayed by separate contractors, or by unusually severe weather conditions not reasonably anticipated for the locale, or by fire, unavoidable casualty, acts of God, any industry-wide dispute which prevents Subcontractor from obtaining labor or materials necessary for performance of the Work (provided, however, that suitable substitute materials or labor are not reasonably obtainable), or any industry-wide labor dispute or other delay not within the reasonable control of Subcontractor which prevents the transportation of necessary materials to the applicable Project/Job Site (provided, however, that suitable substitute transportation of such materials is not reasonably available), or national emergency (collectively, "Permitted Delays"), then the Contract Completion Time for the subject Work shall be extended by Change Order for a period equal to the length of the Permitted Delay, if, within five (5) days after the commencement of any Permitted Delay, Subcontractor delivers to Contractor a written notice of the Permitted Delay stating the nature thereof, and within ten (10) days following the expiration of the Permitted Delay, provides a written request for extension of the Contract Completion Time by reason of the Permitted Delay and such extension is approved by Contractor, which approval shall not be unreasonably withheld; provided, however, that no such extension shall be given unless the delay for which a request for extension is made is included in those items for which an extension of the Contract Completion Time is appropriate pursuant to the provisions of this Section 1.8.2. If Subcontractor fails to deliver to Contractor the written notices required by this Section 1.8.2 within the required periods, then the extension of the Contract Completion Time attributable to such Permitted Delay shall be decreased by one (1) day for each day beyond the applicable five (5) day period Subcontractor fails to deliver any required written notice to Contractor. No extension of the Contract Completion Time (or right on the part of Subcontractor to secure any such extension) pursuant to this Section 1.8.2 shall prejudice any right Contractor may have, under this Agreement or otherwise, to terminate this Agreement or any Work Agreement. If Subcontractor fails to so notify Contractor of a Permitted Delay, the Contract Completion Time shall not be extended.

1.8.3 LIQUIDATED DAMAGES. Contractor and Subcontractor acknowledge and agree that time is of the essence with respect to this Agreement and all Work Agreements. Subcontractor and Contractor further acknowledge and agree that if any Work is not completed by Subcontractor within the applicable Contract Completion Time, subject to Permitted Delays, Contractor will suffer substantial damages which are, at the date of execution of this Agreement, and will be, at the time of execution of any Work Agreement, extremely difficult and impracticable to ascertain. Therefore, Contractor and Subcontractor agree that if Subcontractor shall fail to complete the Work within the applicable Contract Completion Time, Subcontractor shall pay Contractor as liquidated damages, and not as a penalty but as a reasonable estimate as of the date of execution of this Agreement of the amount of damages Contractor will suffer due solely for delay the daily amount determined by multiplying the Daily Contract Price (as defined herein) by five percent (5%), per day for each calendar day beyond the applicable Contract Completion Date that the Work has not been completed, rounded up to the next $100 increment. For purposes of this Section 1.8.3, the "Daily Contract Price" is the Contract Price divided by the number of days in which the Work is to be completed, as set forth in the applicable Construction Schedule. As an example of the calculation of the daily liquidated damages amount to be paid under this Section 1.8.3, if the Contract Price is $1,000,000, and the time in which the Work is to be completed under the Construction Schedule is 162 days, the Daily Contract Price is $6,173 ($1,000,000 divided by 162 days), and the daily liquidated damage amount is $308.64 ($6,173 times 0.05), which is rounded up to $400 per day. Subcontractor further agrees that permitting Subcontractor to continue or finish Subcontractor's Work or any part thereof after the Contract Completion Time, will in no way operate as a waiver on the part

of Contractor of any rights of Contractor under this Agreement. Notwithstanding anything in the foregoing to the contrary, Contractor and Subcontractor acknowledge and agree that this liquidated damages provision shall only apply to damages caused by Subcontractor's failure to complete the applicable Work within the Contract Completion Time. The parties further acknowledge and agree that Contractor is entitled to any and all legal and equitable remedies Contractor may have where Contractor's damages are caused by any reason other than Subcontractor's failure to complete the applicable Work within the Contract Completion Time.

1.8.4 FAILURE TO COMPLY WITH CONSTRUCTION SCHEDULE. If Contractor determines that the progress of the Work pursuant to any Work Agreement is not in substantial conformance to the Construction Schedule and Work will not be completed within the Contract Completion Time, Contractor may require Subcontractor to take such actions as Contractor deems necessary to expedite progress of the Work to be in conformance with the Construction Schedule. Such actions may include, without limitation, increasing the number of workers performing the Work, utilizing overtime work and requiring additional work shifts. Such action by Contractor to require Subcontractor to conform to the Construction Schedule shall not entitle Subcontractor to receive any additional compensation for any such required activities.

1.9 WORK OF OTHERS. Subcontractor shall be responsible for protecting its Work, and the work of other subcontractors or Contractor until final acceptance by Contractor, any requisite governmental authority, and any applicable homeowners' or community association. Subcontractor shall, without limitation, be fully responsible for the protection of all existing structures, materials, equipment, curbs, landscaping, flora, fauna, and adjacent property, if any. Subcontractor shall be responsible for inspecting the work of other subcontractors that may affect its own Work and shall immediately report to Contractor, in writing, any defects, discrepancies or problems which could adversely affect Subcontractor's work.

1.10 MATERIALS. Unless otherwise specifically stated in this Agreement, all materials must be new and (i) are to be shipped F.O.B. Job Site and paid for by Subcontractor, and (ii) shall be used within seven (7) days of their receipt or longer, as agreed to in writing between Contractor and Subcontractor, but in no event shall ownership, responsibility, or risk of loss shift to Contractor with respect to such materials except as set forth in this Section 1.10. Deliveries to and storage at the Project or Job Site are the sole risk and responsibility of the Subcontractor. Subcontractor shall be responsible for damage or loss to all material and equipment until final payment by Contractor. No materials will be paid for until properly installed. Title to the Work shall vest in Contractor upon performance; provided, however, the vesting of such title shall not impose any obligations on Contractor or relieve Subcontractor of any of its obligations hereunder. To the extent not prohibited by law, Subcontractor hereby waives any security interest or removables rights it may have in goods or material to be supplied hereunder and waives its right to the remedies available for a buyer's breach as provided in the Uniform Commercial Code. On-site storage for materials is not provided unless otherwise set forth in herein.

1.11 DELAYS AND DISRUPTIONS/WAIVER OF CONSEQUENTIAL DAMAGES. IN THE EVENT OF ANY DELAY, DISRUPTION, INTERFERENCE, STOPPAGE OR HINDRANCE IN COMMENCEMENT OR PROSECUTION OF THE WORK CAUSED BY ANY REASON WHATSOEVER ("WORK INTERRUPTIONS"), INCLUDING ANY WORK INTERRUPTIONS CAUSED IN WHOLE OR IN PART, OR ALLEGED TO HAVE BEEN CAUSED IN WHOLE OR IN PART, BY CONTRACTOR OR OTHER SUBCONTRACTORS, SUBCONTRACTOR, TO THE FULLEST EXTENT PERMITTED BY LAW, HEREBY WAIVES ANY DAMAGES CAUSED BY SUCH WORK INTERRUPTIONS. SUBCONTRACTOR'S SOLE AND EXCLUSIVE REMEDY FOR ANY WORK INTERRUPTIONS SHALL BE AN EXTENSION OF TIME TO PERFORM ITS WORK. TO THE FULLEST EXTENT PERMITTED BY LAW SUBCONTRACTOR SPECIFICALLY WAIVES ANY RIGHT TO RECOVER DIRECT, INDIRECT, CONSEQUENTIAL, IMPACT, OR OTHER

COSTS, EXPENSES, OR DAMAGES, INCLUDING BUT NOT LIMITED TO DELAY DAMAGES, COSTS OF ACCELERATION, INEFFICIENCY, LOSS OF ORGANIZATION, LOSS OF PROFITS, JOB SITE OR HOME OFFICE OVERHEAD, LABOR OR MATERIAL ESCALATION, OR DETERIORATION OF MATERIALS, CAUSED BY ANY WORK INTERRUPTION OR OTHER CAUSE, INCLUDING THE FAULT OF CONTRACTOR OR ANY OTHER PERSON. NOTWITHSTANDING THE FOREGOING, THESE WAIVERS SHALL NOT PRECLUDE RECOVERY OF DIRECT DAMAGES BY SUBCONTRACTOR FOR WORK INTERRUPTIONS CAUSED SOLELY BY FRAUD, BAD FAITH, OR ACTIVE INTERFERENCE ON THE PART OF CONTRACTOR.

1.12 BONDS. If applicable, Subcontractor shall provide within five (5) days after Contractor's request, both a performance and a payment bond as security for performance and payment of all of its obligations under this Agreement. Such bonds shall (a) be in amounts at least equal to the Contract Price, (b) be in a form acceptable to Contractor, (c) provide that Subcontractor and Surety agree to perform on all terms, covenants and conditions of the Work, and (d) be issued by sureties qualified to do business in the state where the Project or Job Site is located and named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds," as published in the Federal Register as Department Circular 570 by the Financial Management Services of the U.S. Department of Treasury.

Upon the incremental completion of the Work, Contractor may, but is under no obligation to, permit Subcontractor to reduce the amount of the performance bond to a lower level specified by Contractor for the duration of the warranty period, or Contractor may allow Subcontractor to replace the performance bond with a one (1) year maintenance bond in an amount less than the face amount of the performance bond. In any event, Contractor shall release all bonds upon the expiration of the warranty period.

2. LABOR AND SUPERVISION: Subcontractor shall maintain competent and sufficient supervision and employees on site during all times that Subcontractor is performing its Work. Subcontractor's superintendent shall be experienced, fully able to communicate with Contractor, trained, knowledgeable as to the Work, and shall have full authority to act for and bind Subcontractor. Subcontractor's superintendent shall be satisfactory to Contractor, and shall not be changed without Contractor's written consent. All communications or directions given to the Subcontractor's superintendent shall be as binding as if given to Subcontractor. Subcontractor shall enforce strict discipline and good order among its employees and Sub-subcontractors, and shall not employ, and shall immediately remove, any unfit or unskilled person. Subcontractor shall maintain a list of all persons performing its Work on the Job Site, including the list of Sub-subcontractors as provided pursuant to Section 1.4, and shall produce such list to Contractor upon request. Subcontractor shall perform criminal background checks of any person that will perform any portion of its Work, and, to the fullest extent permitted by law, Subcontractor shall not allow any registered sex offender, or any person convicted of a felony or a misdemeanor involving theft, larceny, violence, sexual assault, or any other crime of moral turpitude to work at the Project or Job Site. In performing such background checks, Subcontractor shall comply with all requirements of the Fair Credit Reporting Act and any other applicable laws and regulations. Subcontractor acknowledges and agrees that no person directed, invited, licensed, or engaged by Subcontractor or any Sub-subcontractor to be present on a Job Site or perform any portion of the Work, regardless of whether in exchange for wages or any other remuneration of any type, shall be an employee of Contractor or its affiliates, and Subcontractor assumes all liabilities, employment-related or otherwise, that may arise from such persons.

3. LEGAL COMPLIANCE: Subcontractor and any Sub-subcontractors shall, at all times, comply with all applicable local, state, or federal statutes, ordinances, rules and regulations, and any current or future amendments thereto, as well as those of any other public body having authority concerning the Work, including *without limitation*, the Occupational Safety and Health Act of 1970, 29 U.S.C. §§ 651 et seq., the Foreign Corrupt Practices Act of 1977, as amended, 15 U.S.C. §§ 78dd-1, et seq. , the Immigration Reform and Control Act of 1986, the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, the Immigration and Nationality Act, all applicable equal employment

opportunity laws and requirements promulgated by any governmental authority, including, without limitation, the requirements of Title VII of the Civil Rights Act of 1964, 42 U.S.C. §1981, et seq., Executive Orders 11246, 11375 and 11478, the Age Discrimination in Employment Act, the Americans with Disabilities Act, and the Fair Labor Standards Act; all applicable local, state, or federal environmental laws and regulations including, without limitation, the Clean Air Act, 42 U.S.C. §§ 7401-7671; the Clean Water Act, 33 U.S.C. §§ 1251-1387; the Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. §§ 9601-9675; the Solid Waste Disposal Act, 42 USC §§ 6901-6992, the Toxic Substances Control Act, 15 U.S.C. §§ 2601-2692; and the Endangered Species Act of 1973, 16 U.S.C. §§ 1531-5. Further, Subcontractor represents and warrants that it has read and understood the requirements of the California Consumer Privacy Act of 2019, California Civil Code Section 1798.100, et seq., and regulations thereto, (jointly "CCPA") and will abide by the same as applicable for California consumers, as defined therein. Subcontractor acknowledges that it is prohibited from retaining, using, or disclosing California consumer's personal information for any purpose other than the specific purpose of performing the Work hereunder. Subcontractor agrees to delete any consumer's personal information at the conclusion of the applicable Work, as requested by Lennar, or as requested by consumer and required by the CCPA; Subcontractor shall establish proper protocol and security to address the requirements of the CCPA .

Moreover, Subcontractor represents and warrants that it has read and understood the requirements of the California Privacy Rights Act of 2020 (CPRA), as currently drafted. Once the CPRA becomes operative, applicable, and effective under California law, Subcontractor warrants that it will review, familiarize itself, and take any necessary steps to understand the final enacted version of the CPRA, including review of any changes or amendments to the CPRA. Once the CPRA is effective, Subcontractor represents and warrants that it will abide by the same as applicable for California consumers, as defined therein. Subcontractor also represents and warrants that they will take reasonable and appropriate steps to ensure that any Sub-subcontractor, service provider, and/or agent will abide by the requirements of the CPRA as applicable for California consumers, as defined therein. Subcontractor acknowledges that it is prohibited from retaining, using, or disclosing California consumer's personal information for any purpose other than the limited and specific purpose of performing the Work hereunder. Subcontractor agrees to delete any consumer's personal information at the conclusion of the applicable Work, as requested by Lennar, or as requested by consumer and required by the CPRA; Subcontractor shall establish proper protocol and security to address the requirements of the CPRA. If Subcontractor, or its Sub-subcontractor, service provider, vendor, and/or agent(s), determines that it can no longer meet its obligations under the CPRA, Subcontractor must immediately inform Lennar. Upon notice of such determination by Subcontractor, Lennar may take any and all reasonable and appropriate steps to stop and remediate unauthorized use of personal information.

3.1 IMMIGRATION. With respect to its obligations herein or in any Work Agreement, Scheduling Notice, or in any amendment thereto, Subcontractor specifically warrants and covenants that it (i) shall not knowingly hire or continue to employ aliens not authorized to work in the United States, (ii) has and shall continue to verify the employment documentation as specified in all applicable immigration laws, and (iii) has and shall properly complete and retain the U.S. Citizenship and Immigration Services' Form I-9 for all its employees covered by immigration laws. Accordingly and pursuant to the indemnity requirements of this Agreement, Subcontractor agrees to defend, indemnify and hold Contractor free and harmless from and against any claims or charges asserted or filed against and any judgments, fines, penalties or assessments entered against Contractor arising from or as the result of the employment or engagement by Subcontractor or any Sub-subcontractors of any person inconsistent with the foregoing covenants or the laws of the United States and other applicable laws. In addition, should Subcontractor fail to comply with this Section, Contractor shall have the right to rescind this Agreement and/or declare Subcontractor in default under this Agreement and as a result Contractor will be entitled to all direct, indirect, consequential, impact, or other costs, expenses, or damages, including but not limited to costs, loss of organization, lost profits, or attorneys' fees and/or paraprofessional fees arising out of or as a result of Subcontractor's breach of this Section. Furthermore, at Contractor's sole discretion and as a monetary remedy for such breach, Contractor may, as liquidated damages and not as a penalty, and because the Parties acknowledge that damages would be uncertain and difficult to ascertain, withhold all or any portion of payments

owed to Subcontractor for any work completed but unpaid prior to Subcontractor's breach, which sums the Parties agree is reasonable in light of the anticipated actual damages.

3.2 PATENT AND COPYRIGHTS. Subcontractor shall assume all liability for and defend, indemnify, and hold harmless Contractor against any claims with respect to royalties, licenses, patent fees, or other fees, charges, fines, penalties, or other charges made in connection with the use of patented or copyrighted processes or materials in connection with its Work. Subcontractor further represents that the performance of the Work and provision of materials in conjunction therewith does not and shall not upon completion and transfer to Contractor, violate or infringe on any trademark, copyright, patent, or other intellectual property right.

3.3 ENVIRONMENTAL. By signing this Agreement, Subcontractor acknowledges that it is responsible for (a) understanding and complying with the specific environmental requirements applicable to the Work, (b) ensuring that the Work does not interfere with efforts by others to comply with environmental requirements, and (c) ensuring the Work does not violate applicable environmental laws and regulations. Subcontractor remains independently responsible for understanding and complying with all applicable environmental requirements regardless of whether a pre-construction meeting is held.

Further, it is acknowledged and agreed by Subcontractor that prior to the initiation of the Work, Subcontractor will inspect the Job Site, observe the environmental conditions, and review Contractor's environmental plans and specifications, including Contractor's Stormwater Pollution Prevention Plan or equivalent ("SWPPP"), wetlands or endangered species limitations, dust control plan, and any Spill Prevention and Control Countermeasure Plan, or its equivalent, if applicable so as to ensure Subcontractor has notice and knowledge of the environmental conditions of the Job Site. If, during the course of its performance of the Work, Subcontractor discovers a previously unidentified environmental condition, Subcontractor shall immediately provide written notice to Contractor and shall not proceed with any Work that would disturb such environmental condition without Contractor's written approval.

Subcontractor shall take care not to damage any Best Management Practices ("BMPs") or Control Measures, as defined below, and in the event Subcontractor or any Sub-subcontractor causes such damage it shall immediately report such damage to Contractor in writing and take appropriate measures to remedy such damage. Without limiting any of its other rights or remedies provided elsewhere in this Agreement (including its right to defense and indemnification by Subcontractor), Contractor may offset from any payments or credits due Subcontractor: (i) the costs to repair or replace any BMPs or Control Measures damaged by Subcontractor or any Sub-subcontractor; and (ii) the costs of all fines, fees, expenses and other penalties sought against or incurred by Contractor due to, in whole or in part, (a) Subcontractor's or any Sub-subcontractor's violation of the obligations herein, (b) Subcontractor's or any Sub-subcontractor's violation of the Water Quality Requirements or Dust Control Requirements, as defined below, including violations arising from damage to BMPs or Control Measures caused by Subcontractor or any Sub-subcontractor, (c) Subcontractor's or any Sub-subcontractor's interference with the implementation of the Water Quality and Dust Control Requirements by Contractor or by any other party responsible for implementing the Water Quality or Dust Control Requirements, (d) spills, releases, or discharges of hazardous, toxic, or other substances caused by Subcontractor or any Sub-subcontractor, (e) Subcontractor's or any Sub-subcontractor's failure to comply with the requirements of Section 3.3.1 of this Agreement regarding hazardous and toxic substances, or (f) Subcontractor's or any Sub-subcontractor's failure to comply with the requirements of Section 3.3.2.1 of this Agreement regarding Spill Prevention, Control and Countermeasures for the Project/Job Site. Failure to satisfy the obligations in this paragraph shall be deemed a material default of this Agreement, and Contractor may, without prejudice to any other right or remedy, withhold any payments to Subcontractor under this Agreement or otherwise until Subcontractor has remedied its failure, and/or terminate this Agreement, withhold payments otherwise due Subcontractor under this

Agreement or otherwise, and retain a separate Subcontractor to complete Subcontractor's obligations at Subcontractor's expense.

3.3.1 HAZARDOUS AND TOXIC SUBSTANCES. Prior to commencing the Work at the Job Site, Subcontractor shall identify in writing all hazardous or toxic substances, as those substances are defined in the applicable environmental laws, to be used in performing the Work by Subcontractor. Subcontractor shall immediately notify Contractor in writing of all hazardous or toxic substances discovered during the performance of the Work or otherwise brought to the Job Site. Subcontractor shall not allow any hazardous or toxic substances on the job site unless (i) necessarily required for the performance of its Work, and (ii) Subcontractor has previously provided Contractor with written notice thereof.

Subcontractor shall immediately notify Contractor of any spill, release, or discharge of any hazardous or toxic substance by itself or any other person. As to any spill, release or discharge of any hazardous or toxic substance which is caused by Subcontractor or any of its employees, agents, Sub-subcontractors, customers, or invitees, Subcontractor shall, at its sole expense, immediately take all reasonable, necessary and legally required actions to prevent the further spread of any spill, release or discharge, and to properly clean up the spill, release or discharge (including without limitation any soil or water contaminated by such spill, release or discharge) in full compliance with all applicable laws and regulations and any directions from Contractor.

3.3.2 WATER QUALITY COMPLIANCE. Subcontractor shall comply, and shall ensure compliance by those acting by, through or under Subcontractor, with all applicable requirements regarding discharges to surface water or groundwater ("Water Quality Requirements") at Contractor's Job Sites. Water Quality Requirements include, but are not limited to, Contractor's SWPPPs; storm water permits, including the state construction general permit or federal construction general permit, whichever is applicable, and local storm water permits; federal, state, and local storm water rules, regulations, and ordinances, including requirements imposed by Municipal Separate Storm Sewer System entities; Clean Water Act Section 404 wetlands permits, regulations, and mitigation agreements; and streambed alteration agreements. Before beginning any Work at a particular Job Site, Subcontractor shall review applicable Water Quality Requirements, copies of which will be available at the Job Site or will be made available upon Subcontractor's request; however, Subcontractor remains independently responsible for understanding and complying with Water Quality Requirements. If required by the Water Quality Requirements or requested by Contractor, Subcontractor shall sign and/or certify the SWPPP before beginning the Work. To the extent applicable to the Work, Subcontractor shall fully comply with and implement the SWPPP, including the BMPs described by the SWPPP. Subcontractor will ensure its workforce, including superintendent, leadspersons, and tradespersons, are trained in storm water management practices and BMPs that apply to the Work. Subcontractor agrees to provide documentation of employee storm water management training to Contractor upon request or if required in the SWPPP and to participate in Contractor's storm water "tailgate" meetings and to document attendance on forms provided by Contractor. Subcontractor shall immediately notify Contractor of any regulatory visit or inspection and any corrective action, notice of correction, notice of violation or any other type of regulatory enforcement action or notice whether written or verbal regardless of the nature or severity related to water quality compliance for the Project/Job Site and/or Subcontractor's Work.

3.3.2.1 SPILL PREVENTION CONTROL AND COUNTERMEASURES. Subcontractor shall comply with all federal, state, and local spill prevention control & countermeasure ("SPCC") statutes, ordinances, rules and regulations, and any amendments thereto, including, but not limited to, the SPCC regulations contained in 40 CFR Part 112 ("SPCC Regulations"), and all amendments thereto; federal,

state and local fire codes; federal and state Occupational Safety and Health Acts (O.S.H.A.); applicable Project/Job Site and facility specific SPCC Plans (as defined below), if any; and, SPCC Best Management Practices (BMPs) contained in the Project/Job Site SWPPP, while Subcontractor or any Sub-subcontractor is mobilized on the Project/Job site or performing Work. In the event there is a conflict between SPCC requirements contained in documents that apply to Subcontractor's Work, (e.g. Fire Code, SPCC Plan or SWPPP), Subcontractor shall comply with the most stringent requirements that apply to Subcontractors Work.

Oil, for the purpose of this Section is defined by the SPCC Regulations, and includes, but is not limited to, petroleum, synthetic oils, gasoline, diesel, motor oil, hydraulic oil, waste oil, or grease. Subcontractor agrees not to mobilize any individual oil storage container with 55 gallons or more of oil storage capacity onto the Project/Job Site, if as a result of such mobilization, the cumulative oil storage capacity at Subcontractors "facility", as defined by the SPCC Regulations, or the cumulative oil storage capacity for the entire Project/Job Site will exceed 1,320 gallons in 55 gallon or larger containers, without either an express written approval from Contractor, or a Project/Job Site or a Subcontractor created "facility" specific SPCC Plan in effect, as described below. If Subcontractor mobilizes containers with 55 gallons or greater of oil storage capacity onto the Project/Job Site which cumulatively exceed an oil storage capacity in excess of 1,320 gallons (US) of oil, Subcontractor shall be required to develop, implement, and maintain an SPCC plan for Subcontractor's "facility" in accordance with all current federal, state and local statutes, ordinances, rules and regulations.

If required, Subcontractor agrees to: (1) develop an SPCC Plan in accordance with good engineering practices; (2) certify the SPCC Plan in accordance with the federal, state and local SPCC statutes, ordinances, rules and regulations; (3) deliver a true executed complete copy of the SPCC Plan, and all supporting documents to Contractor prior to mobilizing oil storage containers with the capacity to individually store 55 gallons or more of oil, and, to cumulatively store more than 1,320 gallons of oil; (4) deliver any and all amendments to the SPCC Plan to Contractor at the time the amendment is added to the SPCC Plan; (5) implement and maintain the SPCC Plan in accordance with its terms; (6) notify Contractor in writing when the Subcontractor's storage capacity no longer exceeds 1,320 gallons for the Project/Job Site; (7) allow Contractor to review and copy any or all SPCC Plan documents, including amendments, inspection reports, and training documentation; and (8) Subcontractor's SPCC Plan shall also provide a written commitment of manpower, equipment, and materials to expeditiously control and remove any quantity of oil discharged.

Contractor reserves the right to develop and implement an SPCC Plan, if Contractor so determines, in its sole and absolute discretion, for any "facility" at the Project/Job Site, or the entire Project/Job Site. If Contractor exercises this option for any reason, Subcontractor shall comply with Contractor's SPCC Plan in its entirety. Contractor may request information from Subcontractor to include in a Contractor SPCC Plan, and Subcontractor agrees to provide the requested information to Contractor by the end of the fifth (5^{th}) day following Contractor's written request, which may include, but is not limited to, any and all information concerning Subcontractor's anticipated or actual oil storage capacity, the nature of the oil to be stored, the locations where the oil will be stored; an estimated inventory and oil storage capacity of containers with an oil storage capacity of 55 gallons or larger; secondary containment practices for all oil storage containers, spill response and clean up procedures to be implemented by Subcontractor in the

event of a spill; and, documentation of training of Subcontractor's workers with SPCC responsibility. **However, Subcontractor remains independently responsible for understanding and complying with the SPCC Regulations and shall indemnify and defend Contractor with respect to any claims, liabilities, losses, costs, or expenses resulting from Subcontractor's violation of SPCC Regulations or any spill caused in whole or in part by Subcontractor**. At all times, Subcontractor shall supply workers trained with the knowledge, expertise and experience to operate Subcontractor's oil storage facility, regardless of size or storage capacity, in accordance with all federal, state, and local regulations; the SWPPP; and, the SPCC plan if applicable.

Subcontractor shall immediately notify Contractor in writing of any regulatory inspection and any corrective action, notice of corrective action, notice of violation or any other type of regulatory enforcement action or notice whether written of verbal regardless of the nature or severity related to SPCC compliance for the Job site and/or Subcontractor's Work.

3.3.3 AIR QUALITY COMPLIANCE. Subcontractor shall comply, and shall ensure compliance by those acting by, through or under Subcontractor, with federal, state, and local air quality and dust control rules, regulations, and ordinances and Contractor's site-specific dust control plans and/or permits, if applicable (collectively "Dust Control Requirements"). Before beginning any Work, Subcontractor shall review the applicable Dust Control Requirements, copies of which will be available at the Project/Job Site or will be made available upon Subcontractor's request; however, Subcontractor remains independently responsible for understanding and complying with Dust Control Requirements. To the extent applicable to its work, Subcontractor shall fully comply with and implement the control measures described by the Dust Control Requirements ("Control Measures") including work practices such as controlling off-site vehicle track-out and using only designated points of ingress and egress at the Job Site. Subcontractor shall immediately notify Contractor in writing of any regulatory visit or inspection and any corrective action, notice of correction, notice of violation or any other type of regulatory enforcement action or notice whether written or verbal regardless of the nature or severity related to air quality compliance for the Project/Job Site and/or Subcontractor's Work. Dust Control Regulations shall also be defined to include, without limitation, all regulations regarding respirable crystalline silica dust.

3.3.4 OTHER ENVIRONMENTAL REQUIREMENTS. The requirements in Sections 3.3.1, 3.3.2, 3.3.2.1 and 3.3.3 of this Agreement are not all-inclusive, and Subcontractor remains obligated to comply and cause any Sub-subcontractors to comply with all environmental laws, rules, and regulations even if not set forth herein. Further, Contractor reserves the right to specify other environmental requirements with which Subcontractor shall comply.

3.4 SAFETY. Subcontractor is an independent contractor and shall be **solely responsible** for ensuring that its Work is performed in a safe manner. Nothing herein shall be deemed to be an exercise of control by Contractor of Subcontractor's safety obligations. Subcontractor shall take all reasonable and necessary safety precautions with regard to the Work, shall coordinate its safety precautions as required, and shall comply with all safety requirements, laws, regulations, rules or ordinances of any authority (governmental or otherwise) responsible for the safety of persons or property. Subcontractor shall notify Contractor, both verbally and in writing, of all injuries to Subcontractor's or any Sub-subcontractor's employees within eight (8) hours of the injury. Failure to adhere to Contractor's safety policies, the safety requirements of this Agreement, or the job rules shall be deemed a material default of Subcontractor's obligations. Subcontractor agrees to comply with all health and safety programs, as well as any rules promulgated by Contractor, in furtherance of Subcontractor duties under the Occupational Safety and Health Act ("OSHA"), including, without

limitation, all regulations regarding respirable crystalline silica as set forth in OSHA Regulation 29 C.F.R. §1926.1153, and in any successor or similar statute. If in the opinion of Contractor the health and safety of any person or persons is endangered or appropriate safety measures are not being implemented, Contractor may (but is not required to) take such action as it deems necessary and appropriate, including without limitation, the following: (i) stop Subcontractor's Work or require Subcontractor to immediately remedy any unsafe condition caused by the Subcontractor at its own expense; (ii) shut the Project/Job Site down, in whole or in part, until any unsafe condition is remedied; (iii) remedy any unsafe condition caused by Subcontractor or any Sub-Subcontractor at Subcontractor's sole expense; (iv) terminate this Agreement and hold Subcontractor fully liable for any losses incurred by Contractor as a result of such unsafe condition and such termination; (v) recover against Subcontractor all fines or penalties assessed by any authority (governmental or otherwise) and caused by or alleged to have been caused by Subcontractor; and/or (vi) Assess safety violation penalties of up to $200.00 for each violation of jobsite safety rules or governmental safety laws, regulations, rules or ordinances. Contractor may backcharge or separately invoice the Subcontractor for such safety violation penalties.

4. JOB RULES: Subcontractor is solely responsible for complying with and ensuring compliance by its employees and any Sub-subcontractors with (i) Contractor's Code of Safe Practices, (ii) other Contractor policies concerning safety, reasonable restrictions on use and access to the Project/Job Site by unauthorized personnel, and (iii) the other rules and policies concerning Subcontractor's work, including as set forth in the "Job Rules" (attached hereto as Schedule "3") or as provided otherwise, including posting at the Project/JobSite. Upon failure to so comply, Contractor may, in addition to the other remedies herein, stop Subcontractor's Work and/or terminate this Agreement.

5. LIENS AND BOND CLAIMS: Except to the extent Contractor is delinquent in paying undisputed amounts that are due and payable hereunder, Subcontractor shall keep the Work and the real property being improved by Subcontractor free and clear of any liens, stop notices, fund trapping notices, or bond claims of any kind whatsoever (collectively "Lien or Bond Claims"), to the extent such Lien or Bond Claims (a) relate to Subcontractor's Work, or (b) are for any monies due or allegedly due (i) Subcontractor or any Sub-subcontractor, (ii) any factoring company, lender (secured or unsecured), or (iii) any other entity claiming by, through or under Subcontractor or any Sub-subcontractor (collectively the "Lien Claimants"). In the event a Lien or Bond Claim is filed or threatened to be filed by any Lien Claimant, Subcontractor shall, at Contractor's sole election, immediately settle and resolve such claim and obtain a full waiver and release of the Lien or Bond Claim from the Lien Claimant, or provide a statutory bond acceptable to Contractor that will bond around or discharge such Lien or Bond Claim. Should Subcontractor fail to do so within two (2) business days, Contractor may, without additional notice to Subcontractor, (A) settle, bond or discharge the Lien or Bond Claim in any manner Contractor deems appropriate, and charge the costs thereof (including payment of the lien, stop notice or fund trapping notice, or bond claim amount, premiums for bonds, overhead, costs, and reasonable attorneys' fees and paraprofessional fees) to Subcontractor, and/or (B) withhold further payments to Subcontractor under this Agreement or otherwise until Subcontractor has complied with its obligations herein. Subcontractor's obligation to pay such costs is not limited to any monies, if any, then due or to become due Subcontractor under any contract between Contractor and Subcontractor. To the fullest extent permitted by law, Subcontractor has not and shall not assign any right or claim for payment from Contractor or any right to perfect a lien against the Work or real property to any third person. Any assignment or attempted assignment shall be unenforceable against Contractor, and shall be deemed a material default of this Agreement. Subcontractor shall include substantially identical language to this Section 5 in all subcontracts with any Sub-subcontractor, and shall also require that all Sub-subcontractors shall waive and release all liens and claims to liens as a condition to their receiving payment.

5.1 At Contractor's request, Subcontractor shall provide the following to Contractor: (i) proof of payment for labor, equipment or material or equipment supplied for the Work or any other obligation for payment arising from the Work; and (ii) an affidavit stating that every Sub-subcontractor has been paid in full up to and including the date of any payment application or to the extent not paid, the names of any such person or entity who has not been paid in

full and the amount due each. If Contractor believes that Subcontractor's financial circumstances will affect Subcontractor's performance of its obligations herein, Contractor may take any other precautionary action it deems reasonably necessary to protect its interests including, without limitation, (A) the right to request additional financial assurances from Subcontractor, (B) the right to require Subcontractor to post, at Subcontractor's cost, a payment bond, (C) the right to withhold all or any portion of payments due Subcontractor as permitted by applicable law, or (D) the right to make payments jointly to Subcontractor and any person claiming monies from Subcontractor or any Sub-subcontractor.

5.2 CONDITIONAL/UNCONDITIONAL LIEN WAIVERS.

5.2.1. As a condition precedent to receiving each and any payment for Work as described in Section 12 hereof, Subcontractor shall execute and furnish to Contractor for itself and all applicable Sub-subcontractors a state-specific conditional or progress lien waiver or affidavit (each a "Conditional Lien Waiver") acknowledging receipt of such payment set forth in the Subcontractor's Application for Payment to the extent payment is actually received, as well as a state-specific unconditional lien waiver or affidavit ("Unconditional Lien Waiver") acknowledging payment received on previous Applications for Payment, if any and if allowed or prescribed under applicable state law. If applicable, the lien waivers should exclude the retention amount as further defined in Section 12. With Subcontractor's application for final payment for the Work under a Work Agreement, Subcontractor shall execute and furnish to Contractor a Conditional Lien Waiver for such final payment to the extent such payment is actually received, and shall cause each Sub-subcontractor to execute and provide to Contractor an Unconditional Lien Waiver acknowledging receipt of all payments due with respect to the Work under such Work Agreement. Within thirty (30) days of receipt of final payment under any Work Agreement, Subcontractor, for itself and all Sub-Subcontractors, shall submit to Contractor an Unconditional Lien Waiver acknowledging final payment. The lien waivers required to be delivered under this Agreement shall be in a form as provided by state law and reasonably acceptable to Contractor and, at Contractor's election, shall be signed electronically in conformance with the Uniform Electronic Transactions Act and returned to Contractor via Contractor's electronic billing system. Subcontractor shall also comply with all procedural requirements of laws of the state that govern this Agreement with respect to the enforceability of such lien waivers. Subcontractor agrees to provide Contractor with labor, materials and supplies that are free and clear of any debt or lien against the labor, materials or supplies and, in addition to any other indemnification obligations under this Agreement, Subcontractor shall indemnify, defend, and hold Contractor harmless from and against any claim, loss, cost or expense relating to any debts or liens against the Property relating to the Work except to the extent resulting from Contractor's failure to pay undisputed costs of the Work prior to expiration of applicable lien filing deadlines. Subcontractor shall include such requirements in each contract with any Sub-subcontractors relating to the Work.

5.2.2 Should Contractor determine that Contractor will make payments directly to Sub-subcontractors for any reason, said directly paid amounts shall be deducted from the sums paid to Subcontractor hereunder, but shall be deemed a credit against the amount owed with respect to a given Application for Payment. Subcontractor shall provide appropriate lien waivers on its own behalf that are inclusive of all sums paid out with respect to any such approved Application for Payment. Subcontractor shall remain responsible for ensuring that applicable lien waivers of Sub-subcontractors, as set forth in Section 5.2.1 are supplied to Contractor. Upon application for final payment for the Work, Sub-subcontractors shall execute and furnish to Contractor, through Subcontractor, an Unconditional Lien Waiver for all payments due Sub-subcontractors relating to the Work.

6. CONTRACTOR'S EQUIPMENT: Should Subcontractor or any Sub-subcontractor use equipment, scaffolding or other facilities of Contractor or another subcontractor, it is understood and agreed that (i)

Subcontractor and such Sub-subcontractor shall fully inspect and become familiar with the proper and safe use of such equipment, scaffolding or facilities, (ii) Subcontractor and Sub-subcontractor shall properly train and supervise their employees in the proper and safe use of such equipment, scaffolding and facilities, and (iii) Subcontractor's or Sub-subcontractor's use of such equipment, scaffolding or facilities shall be at their sole risk. Subcontractor and Sub-subcontractors waive all claims and liability of any type or nature against Contractor and the owners or lessors of such equipment, scaffolding or other facilities, assumes the full risk of the operation thereof, and assumes full responsibility for any and all loss, cost, expense (including all attorneys' fees and paraprofessional fees), damage, or injury arising therefrom.

7. SECURITY AND STORMS: Subcontractor shall be solely responsible for providing security for the Work, tools, equipment, materials, or other property. Regardless of whether Contractor provides security at the Project/Job Site, Contractor shall not be responsible for theft, vandalism, or loss to any of Subcontractor's or Sub-subcontractor's work, tools, equipment, materials, or other property. Further, Subcontractor agrees to provide any means necessary to remove or secure Subcontractor's tools, equipment, and materials at the Project in the event of an impending storm or at the request of Contractor. Subcontractor acknowledges that it is Subcontractor's responsibility to provide sufficient manpower/equipment, in such cases, to insure maximum safety in the event of a storm occurrence. If Subcontractor is unable to perform this service in the event of an impending storm or as required by Contractor, Contractor reserves the right to take whatever action is deemed required and back charge all associated costs to Subcontractor. Subcontractor also agrees to hold Contractor harmless for any damage to tools, equipment, and/or materials left at the Project in the event of a storm occurrence.

8. CLEAN UP: Subcontractor shall maintain a tidy Job Site and clean up and haul away all debris, rubbish, hazardous or toxic discharges and surplus materials ("Construction Debris") on a daily basis and properly dispose of such Construction Debris in an authorized trash bin or at a licensed or certified landfill. In addition, Subcontractor will leave the Job Site, subject property and, if applicable, the building premise(s) clean and in good order. These obligations are in addition to Subcontractor's obligations under any other section of this Agreement. If, after twenty-four (24) hours' notice by Contractor's representative to Subcontractor's representative, Subcontractor has not diligently proceeded with the clean-up as outlined in this Section 8, then Contractor shall have the right to proceed with the clean-up at Subcontractor's expense.

9. INSURANCE: Before starting the Work, Subcontractor shall procure and maintain at its own expense, and cause all Sub-subcontractors to procure and maintain at no cost to Contractor, the insurance set forth in the "Insurance Requirements" attached as Schedule "4", which is incorporated by this reference as though set forth in full herein, and as may be amended by the applicable Work Agreement in Exhibit "G" thereto ("Modified Insurance Requirements").

10. EXPRESS WARRANTIES: To the extent required by law, Subcontractor warrants that it is properly licensed to perform the Work hereunder or under the applicable Work Agreement(s) and shall maintain all required permits and licenses in good standing at all times, including, without limitation, all necessary construction and business licenses. Subcontractor expressly warrants to Owner, Contractor, Contractor's customers, and any current or subsequent owner of property on which Subcontractor's Work is performed (collectively "Warranty Beneficiaries"), that its Work shall be performed in a good and workmanlike manner, free from defects in workmanship or materials, and in strict accordance with (i) the plans and specifications, (ii) any applicable manufacturer's specifications, recommendations or requirements, and (iii) all applicable laws, industry standards, codes, or other rules or regulations applicable to the performance of the Work. This warranty Section is in addition to warranties provided by law and shall continue for so long as any Warranty Beneficiary has legal liability. Any portion of Subcontractor's Work not complying with the foregoing shall be deemed to be in breach of this Section. Subcontractor shall require that each Sub-subcontractor give to Contractor the same warranty as to such Sub-subcontractor's portion of the work. Additionally, for a period of four (4) years from the date of acceptance of the Work by Contractor, any requisite governmental authority, and any applicable homeowners' or community association, Subcontractor shall, within two (2) working days of notification by Contractor, repair or replace any such Work unless the warranty work could not reasonably be performed within such time period, in which event the warranty work shall be performed as quickly as reasonably possible. In the event of an emergency (as determined by

Contractor), the Subcontractor shall perform its warranty work within eight (8) hours. In addition, a seven (7) day-a-week and a twenty-four (24) hour on-call emergency service must be provided by Subcontractor and any Sub-subcontractor providing roofing, plumbing, electrical and/or HVAC work.

10.1 Manufacturer's Warranties. Prior to the earlier of completion and acceptance of the Work or upon the termination of this Agreement, Subcontractor shall provide Contractor with any and all applicable manufacturer's warranties on equipment or materials furnished pursuant to this Agreement. Subcontractor shall fully cooperate with Contractor in making any claim on any manufacturer's warranty.

11. EXTRA WORK/CHANGES: NO EXTRA WORK OR CHANGES TO THE WORK SHALL BE PERFORMED BY SUBCONTRACTOR OR PAID FOR BY CONTRACTOR UNLESS SUCH EXTRA WORK OR CHANGE TO THE WORK HAS BEEN AUTHORIZED IN WRITING BY CONTRACTOR AND AGREED TO BY SUBCONTRACTOR PRIOR TO PERFORMANCE THEREOF. ALL EXTRA WORK OR CHANGE TO THE WORK (EACH, A "CHANGE ORDER") SHALL BE REQUESTED BY SUBCONTRACTOR IN WRITING AND SHALL INCLUDE AN ITEMIZATION OF THE REQUESTED CHANGE, TOGETHER WITH THE ESTIMATED COST OF THE CHANGES AND SHALL BE SUBMITTED TO CONTRACTOR ("REQUEST FOR CHANGE ORDER"). THE COST CHANGES SHALL INCLUDE ALL LABOR AND EQUIPMENT TO COMPLETE THE WORK AND SHALL BE BILLING RATES, WITH NO FURTHER MARKUPS TO BE ADDED; ALL EQUIPMENT SHALL INCLUDE FUEL, LUBRICATION, OPERATION AND ALL MAINTENANCE. NO OVERTIME PREMIUM WILL BE PAID ON EQUIPMENT. FOLLOWING WRITTEN APPROVAL OF REQUEST FOR CHANGE ORDER BY CONTRACTOR, CONTRACTOR SHALL DELIVER TO SUBCONTRACTOR A CHANGE ORDER SUBSTANTIALLY IN THE FORM ATTACHED HERETO AS SCHEDULE "5," OR AS OTHERWISE PROVIDED TO SUBCONTRACTOR IN WRITING. IN THE EVENT THAT ADDITIONAL WORK IS UNDERTAKEN BY SUBCONTRACTOR PURSUANT TO AN APPROVED CHANGE ORDER, THE SUBCONTRACTOR RATES AND RENTAL RATES, ATTACHED TO THE WORK AGREEMENT AS EXHIBIT "H", SHALL PREVAIL.

THE CONTRACTOR MAY ISSUE WRITTEN CHANGE ORDERS TO THE SUBCONTRACTOR VIA EMAIL, MAIL, OR BY HAND. ADDITIVE CHANGE ORDERS SHALL NOT BE EFFECTIVE UNTIL EXECUTED BY THE SUBCONTRACTOR AND CONTRACTOR; DEDUCTIVE CHANGE ORDERS SHALL BE EFFECTIVE UPON SIGNATURE OF CONTRACTOR ONLY AND DELIVERY OF NOTICE TO SUBCONTRACTOR. UPON EXECUTION OF SUCH CHANGE ORDERS BY CONTRACTOR AND SUBCONTRACTOR, SUBCONTRACTOR MAY COMMENCE THE WORK DESCRIBED IN THE CHANGE ORDER UPON ISSUANCE OF A NOTICE TO PROCEED BY CONTRACTOR. FAILURE OF SUBCONTRACTOR TO EXECUTE AND RETURN TO CONTRACTOR ANY SUCH CHANGE ORDER WITHIN TWENTY-FOUR (24) HOURS AFTER RECEIPT THEREOF SHALL CONSTITUTE SUBCONTRACTOR'S DISAPPROVAL OF SUCH CHANGE ORDER, AND, IN SUCH EVENT, WITHOUT FURTHER WRITTEN NOTICE FROM CONTRACTOR, SUBCONTRACTOR SHALL NOT COMMENCE THE WORK SET FORTH IN THE CHANGE ORDER.

12. PAYMENT: In consideration of the full and complete performance of the Work and all of the obligations of Subcontractor hereunder and in each Work Agreement, Contractor agrees to pay to Subcontractor, subject to additions and deductions by Change Order as provided in this Agreement, the amount more particularly described in each Work Agreement or Scheduling Notice, as the case may be ("Contract Price"). Subcontractor shall execute and furnish to Contractor lien waivers and releases pursuant to Section 5.2 as a condition precedent to payment. Contractor has no obligation to pay Subcontractor for any Work performed prior to the issuance of the Notice to Proceed by Contractor. No payment shall be due unless Subcontractor has otherwise satisfied all obligations set forth in this Agreement.

12.1 Payment shall be made in accordance with Contractor's standard practices. Payment will only be considered for Work properly performed, and inspected and accepted by Contractor, any requisite governmental authority, and any applicable homeowners' or community association, as of the date of the payment request. Periodically, as required by Contractor (but no less frequently

than once a month), Subcontractor shall submit to Contractor for Contractor's approval, with respect to each Work Agreement, a fully completed "Application for Payment" using the Pricing Schedule (aka, Basis of Contract and Progress Billing Sheet) attached to such Work Agreement as Exhibit "B", with respect to the portion of the Work completed under such Work Agreement during the Invoice Period (defined below) (simultaneously therewith sending copies thereof to such lender(s) of Owner ("Lenders"), if any, as identified on such Work Agreement or as directed by Contractor), unless Contractor has elected to utilize SupplyPro®, as set forth below, in which case such information shall be provided through SupplyPro®. For each Work Agreement, an Application for Payment shall be based on the quantity of the Work completed (if this Agreement is a unit price contract) or the percentage of the Work completed (if this Agreement is a fixed fee/lump sum contract) during the period of time covered by the Application for Payment ("Invoice Period"), less a retention in an amount equal to the legal limit thereof with respect to the portion of the Contract Price set forth on the Application for Payment ("Retention"), upon the terms and conditions set forth in this Agreement, and less any amounts previously paid by or credits to Contractor. The Application for payment shall allocate the entire Contract Price among the various portions of the Work, allocated by line item, and with Subcontractor's fee (if any) shown as a single line item. To the extent that Work is to be performed by a Sub-subcontractor, the Sub-subcontractor's name shall be included in a column next to the line item in the Basis of Contract and Progress Billing Sheet where Sub-subcontractor is being billed through Subcontractor's progress payment, unless Contractor has elected to utilize SupplyPro®, in which case such information shall be provided through SupplyPro®. To the extent that more than one Sub-subcontractor performs Work related to a single line item in the Basis of Contract and Progress Billing Sheet (or SupplyPro®), each Sub-subcontractor billing shall be shown separately and subtotaled at the line item level. As a condition precedent to any payment, Subcontractor shall (i) submit an Application for Payment, and (ii) deliver executed lien waivers and releases in accordance with Section 5.2, and (iii) submit all other documentation reasonably required by Contractor to establish Subcontractor's entitlement to funds. No payment shall be deemed to constitute acceptance by Contractor of any defective or unacceptable Work.

12.2 All payments to Subcontractor are trust funds and shall first be used for the full payment of all Sub-subcontractors. Subcontractor shall ensure that all Sub-subcontractors are at all times fully and timely paid all amounts due in connection with the Work. Subcontractor shall immediately notify Contractor in writing of any claims or disputes involving any Sub-subcontractor. When Contractor learns of any claim or dispute, Contractor may (i) withhold payments otherwise due Subcontractor until the claim or dispute is resolved to Contractor's satisfaction, (ii) issue joint checks to Subcontractor and any claimant, or (iii) deposit any disputed funds into the registry of a court of law. Subcontractor shall reimburse Contractor for any costs incurred by Contractor as a result of such claims or disputes. Should any dispute arise after payment by Contractor, Subcontractor shall immediately deposit any payments made relating to such labor or material into an interest-bearing account and shall only use this money to resolve such claims or disputes.

12.3 Contractor shall withhold retention from each payment as provided by applicable law, and shall release such retention when (i) Subcontractor has fully performed its obligations herein (save and except future extended warranty obligations), (ii) Subcontractor has provided lien releases and waivers as provided for in Section 5.2, (iii) the Work has been accepted by Contractor, any requisite governmental authority, and any homeowners' or community association, and (iv) the legal time period for holding such retention has expired. In the absence of any legally required amount, the retention shall equal ten (10%) percent of each payment.

12.4 Contractor may, at its option, issue, file, and/or record with the appropriate regulating agency, a Notice of Completion. By issuing, filing, and/or recording the notice of completion, Contractor does not release the Subcontractor from any of Subcontractor's obligations under this Agreement and/or any Work Agreement or Change Order issued hereunder. Without limiting the generality of the foregoing, in no event shall the issuance, filing, and/or recordation of a notice of completion be deemed to commence any warranty obligations with respect to the Work performed by Subcontractor, as such warranty obligations are set forth in this Agreement.

12.5 Subcontractor acknowledges that timely submission of requests for payment is a critical aspect of payment under the terms of this Agreement and is material consideration on Contractor's part in entering into this Agreement. Requests for payment submitted more than one hundred twenty (120) days after performance of the Work or delivery of materials would result in additional administrative costs for Contractor and substantial increased project costs. As a result, Contractor and Subcontractor agree that payment for any and all invoices submitted more than one hundred twenty (120) days from the date of performance of the Work or delivery of materials shall, to the fullest extent permitted by applicable law, be waived and Contractor shall have no obligation to make payment to Subcontractor therefor, and Subcontractor shall have no lien rights for the Work or materials for which payment was waived under this 120-day provision. Further, Subcontractor expressly agrees to indemnify and defend Contractor should a lien be filed on any property in connection with labor or materials, for which payment was waived under this 120-day provision, to the fullest extent permitted by applicable law. This provision does not affect Subcontractor's rights, or the rights of any Sub-subcontractor providing labor or materials to timely seek full payment; restrict or limit the constitutional or statutory right to file and record liens or stop notices for non-payment; or take all steps reasonably necessary to preserve its lien and bond rights as permitted by law. Subcontractor shall include notice of this requirement in each contract with Sub-subcontractors relating to the Work.

12.6 In addition to the circumstances set forth in Section 12.5, Contractor may for its convenience determine that Contractor will make payments directly to a Sub-subcontractor, and, in such event, said directly paid amounts shall be deducted from the sums owed Subcontractor hereunder, although Subcontractor shall provide appropriate lien waivers inclusive of all sums. Further, in such event, Subcontractor shall remain responsible for ensuring that all requirements for payment are completed by such Sub-subcontractor and submitted to Contractor by Subcontractor. Regardless of whether payment is made to a Sub-subcontractor or supplier directly by Contractor, or through Subcontractor, Subcontractor shall remain primarily liable for the payments to any Sub-subcontractor. The payments under this Section shall not create any contractual relationship between Contractor and any Sub-subcontractor. Sub-subcontractors are not third party beneficiaries of this Agreement.

12.7 AT CONTRACTOR'S ELECTION, SUBCONTRACTOR AGREES (AND SHALL CAUSE ANY SUB-SUBCONTRACTORS TO AGREE, IF REQUIRED BY CONTRACTOR) TO BE PAID ELECTRONICALLY BY CONTRACTOR, EITHER THROUGH ITS ePAYABLES PROGRAM IF SUBCONTRACTOR (OR A SUB-SUBCONTRACTOR) CURRENTLY HAS A MERCHANT ID, OR THE ACH CREDIT PROGRAM. WITH RESPECT TO THE ePAYABLES PROGRAM, SUBCONTRACTOR AGREES TO ENROLL (AND CAUSE ANY SUB-SUBCONTRACTORS TO ENROLL, IF REQUIRED) IN CONTRACTOR'S ePAYABLES PROGRAM, A GHOST CREDIT CARD PROGRAM OFFERED THROUGH BANK OF AMERICA OR ANY OTHER PROVIDER SELECTED BY CONTRACTOR, AND TO ACCEPT PAYMENT FROM CONTRACTOR THROUGH SUCH PROGRAM. SUBCONTRACTOR FURTHER AGREES THAT IT WILL NOT CHARGE BACK OR PASS THROUGH TO CONTRACTOR ANY MISCELLANEOUS AND/OR CONVENIENCE FEES AS A RESULT OF ACCEPTING PAYMENTS VIA THIS METHOD. WITH RESPECT TO THE ACH PROGRAM, SUBCONTRACTOR AGREES TO ENROLL USING THE ACH CREDIT PROGRAM OFFERED THROUGH WESTERN UNION, OR ANY OTHER PROVIDER SELECTED BY CONTRACTOR, AND TO ACCEPT PAYMENT FROM CONTRACTOR VIA ACH CREDITS TO THE SUBCONTRACTOR'S BANK ACCOUNT INDICATED BY SUBCONTRACTOR ON THE WESTERN UNION SITE.

12.8 Subcontractor acknowledges that if Contractor utilizes the SupplyPro® scheduling system, then Subcontractor agrees to subscribe to and to utilize SupplyPro® to send, receive and respond to notices and documents, and to use the same to initiate requests for payment. All costs of subscribing to, utilizing, and maintaining SupplyPro® for the Subcontractor shall be borne by Subcontractor.

13. REMEDIES AND TERMINATION: In addition to and without limiting Contractor's other remedies set forth herein, in any Work Agreement(s), Scheduling Notices, or as otherwise provided by law or equity, Subcontractor shall be in default and Contractor shall have the following rights:

13.1 Subcontractor shall be in default under this Agreement if Subcontractor shall file for or be adjudged bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency, or if Subcontractor should persistently or repeatedly refuse or should fail to supply enough properly skilled workmen or proper materials or make delivery of materials as required, or if such materialmen or laborers for material supplied or Work performed disregard laws, ordinances, job rules, or instructions, or if Subcontractor fails to make prompt and proper payment for labor, materials, equipment or services provided by, through or under Subcontractor, or if Subcontractor fails to remedy defective Work or fails to perform warranty services or repairs within the time periods set forth in this Agreement, or should Subcontractor cause damage to the work of another subcontractor and/or Sub-subcontractor, or if Contractor is fined by any governmental agency on account of or arising out of the violation by Subcontractor or any Sub-subcontractor of any law, or should Subcontractor fail in Contractor's sole judgment to prosecute its Work diligently and promptly, or if Subcontractor otherwise breaches any of its obligations in this Agreement, any Work Agreement(s), or any of its other agreements with the Contractor or Contractor's affiliates, including, without limitation, the payment in full of all obligations to any wage claimant, state agency, or employee benefit trust fund, or if Contractor has a reasonable basis to believe that Subcontractor will not be able to properly perform all of its obligations in this Agreement or any applicable Work Agreement.

In such an event, Contractor may after giving Subcontractor forty-eight (48) hours' written notice, declare Subcontractor in default and (i) terminate this Agreement or applicable Work Agreement(s) and, as to such terminated Work Agreement(s), take possession of Subcontractor's materials, tools, equipment and appliances thereunder and finish the Work by whatever method Contractor may deem expedient in its sole discretion, (ii) withhold payment otherwise due Subcontractor (consistent with applicable law) until the Work is completed and accepted, or until defective Work is remedied, or until warranty services are properly performed, or until such breach has been remedied, or until such obligation has been satisfied, (iii) stop the Work until such breach has been cured to Contractor's satisfaction, and/or (iv) furnish or cause to be furnished additional labor or materials at Subcontractor's expense. If the costs of completing the Work, furnishing additional labor or materials, or remedying Subcontractor's breach do not exceed the unpaid balance under the applicable Work Agreement for the Work, and if Subcontractor is otherwise entitled to receive payment, Contractor shall pay the difference (less a reasonable sum to ensure Subcontractor's performance of any remaining warranty obligations) to Subcontractor upon completion of the Work. If such expenses of completing the Work or remedying Subcontractor's breach exceed the unpaid balance under any Work Agreement(s), Contractor may offset the difference against any amounts due Subcontractor under this Agreement, any Work Agreement(s), or other contract, or other agreement; or, upon demand, Subcontractor shall pay the difference to Contractor plus any and all costs, expenses and attorneys' fees and paraprofessional fees incurred by Contractor in enforcing or performing any of Subcontractor's obligations under this Agreement and any applicable Work Agreement.

13.2 Contractor shall also have the right to terminate this Agreement and any Work Agreement(s) without cause and for Contractor's convenience. In such event, Subcontractor shall be paid only for that Work actually performed as of the date of termination, and Subcontractor waives recovery for any other costs or damages, direct or consequential including without limitation prospective profits, on Work not performed.

13.3 Should Subcontractor breach any of its obligations in this Agreement or under any Work Agreement(s), Contractor shall be entitled to recover against Subcontractor any reasonable and

necessary attorneys' fees and paraprofessional fees, costs and expenses incurred by Contractor in pursuing claims against Subcontractor.

14. DEFENSE AND INDEMNITY:

14.1 TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, AND IN CONSIDERATION OF THE SUM OF ONE HUNDRED DOLLARS ($100.00), WHICH SUM IS INCLUDED IN THE PRICE(S) ESTABLISHED BY THE WORK AGREEMENT(S) OR SCHEDULING NOTICE(S), THE ADEQUACY AND RECEIPT OF WHICH IS HEREBY ACKNOWLEDGED, SUBCONTRACTOR HEREBY AGREES TO UNCONDITIONALLY DEFEND, INDEMNIFY AND HOLD HARMLESS OWNER, CONTRACTOR, THEIR PARENTS, MEMBERS, AFFILIATES, SUBSIDIARIES, PARTNERS, JOINT VENTURERS, OFFICERS, DIRECTORS, SHAREHOLDERS, AGENTS, EMPLOYEES, INSURERS, SURETIES, ANY OWNER OF REAL PROPERTY IMPROVED OR ALLEGED TO HAVE BEEN IMPROVED BY THE SUBCONTRACTOR, AND ANY SUCCESSORS THERETO, OR ANY OF THEM (COLLECTIVELY "INDEMNIFIED PARTIES") AGAINST ANY AND ALL CIVIL OR CRIMINAL LIABILITIES, COSTS, EXPENSES, CLAIMS, DEMANDS, CAUSES OF ACTION, LIEN CLAIMS, THREATS OF LIENS, STOP NOTICES, FUND TRAPPING NOTICES, BOND CLAIMS, PENALTIES, FINES, CITATIONS, LOSSES, AND DAMAGES (INCLUDING COURT COSTS, ATTORNEYS' FEES AND PARAPROFESSIONAL FEES, AND COSTS OF INVESTIGATION), OF ANY NATURE, KIND, OR DESCRIPTION, ARISING OUT OF, IN CONNECTION WITH, CAUSED BY, ALLEGED TO HAVE BEEN CAUSED BY, OR RESULTING FROM, DIRECTLY OR INDIRECTLY, IN WHOLE OR IN PART, (1) THE WORK, LABOR, MATERIALS, EQUIPMENT OR SERVICES PERFORMED OR SUPPLIED OR ALLEGED TO HAVE BEEN PERFORMED OR SUPPLIED BY SUBCONTRACTOR OR ANY SUB-SUBCONTRACTORS, (2) ANY ACT OR OMISSION OF SUBCONTRACTOR OR ANY SUB-SUBCONTRACTORS, (3) ANY ACT OR OMISSION OF CONTRACTOR OR CONTRACTOR'S OTHER SUBCONTRACTORS, SUB-SUBCONTRACTORS, OR SUPPLIERS OR ANY OF THEIR EMPLOYEES, AGENTS, INVITEES OR ANY PERSON ACTING BY, THROUGH OR UNDER CONTRACTOR OR CONTRACTOR'S OTHER SUBCONTRACTORS, SUB-SUBCONTRACTORS, OR SUPPLIERS, OR (4) THE FAILURE OF SUBCONTRACTOR OR SUB-SUBCONTRACTORS TO PAY IN FULL ALL OBLIGATIONS TO ANY WAGE CLAIMANT, ANY STATE AGENCY, OR ANY EMPLOYEE BENEFIT TRUST FUND, OR OTHER CLAIMS ARISING FROM AN ALLEGED EMPLOYEE RELATIONSHIP OR ALLEGED JOINT EMPLOYMENT (COLLECTIVELY "LIABILITIES"). THE OBLIGATIONS OF SUBCONTRACTOR UNDER THIS INDEMNIFICATION SHALL APPLY TO LIABILITIES EVEN IF SUCH LIABILITIES ARISE FROM OR ARE ATTRIBUTED TO THE CONCURRENT NEGLIGENCE OF ANY INDEMNIFIED PARTY.

14.2 SUBCONTRACTOR SHALL, AT ITS EXPENSE, ASSUME THE DEFENSE AGAINST LIABILITIES OF THE INDEMNIFIED PARTIES, OR ANY OF THEM, AND SHALL CONDUCT SUCH DEFENSE WITH DUE DILIGENCE AND IN GOOD FAITH WITH COUNSEL SELECTED BY CONTRACTOR. THIS DUTY TO DEFEND IS SEPARATE AND DISTINCT FROM ANY OTHER OBLIGATION, INCLUDING THE OBLIGATION TO INDEMNIFY, AND SUBCONTRACTOR SHALL HAVE THE DUTY TO IMMEDIATELY DEFEND UPON WRITTEN REQUEST WITHOUT ANY ORDER OF ANY COURT OR ARBITRATOR. SHOULD SUBCONTRACTOR BREACH ITS DEFENSE AND INDEMNITY OBLIGATIONS, CONTRACTOR MAY, AND WITHOUT RELIEVING SUBCONTRACTOR OF ITS INDEMNITY OBLIGATIONS, ASSUME ANY DEFENSE OBLIGATION AND TRY OR SETTLE SUCH CLAIM, AND SUBCONTRACTOR (1) SHALL REIMBURSE CONTRACTOR FOR ALL COSTS AND EXPENSES INCURRED OR PAID BY ANY INDEMNIFIED PARTY IN THE DEFENSE, SETTLEMENT, TRIAL, MEDIATION OR ARBITRATION, AND (2) PAY ANY JUDGMENT OR AWARD OBTAINED AGAINST THE INDEMNIFIED PARTIES OR ANY OF THEM.

14.3 NEITHER THE INDEMNITY OBLIGATIONS UNDER THIS SECTION, NOR ANY COMMON LAW AND/OR STATUTORY CONTRIBUTION RIGHTS OR OTHER RIGHTS OF CONTRACTOR OR ANY INDEMNIFIED PARTY, SHALL BE LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGE, COMPENSATION, OR BENEFITS PAYABLE BY OR FOR THE SUBCONTRACTOR OR CONTRACTOR UNDER INSURANCE POLICIES,

WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS, OR OTHER EMPLOYEE BENEFIT ACTS. THIS PROVISION IS SEPARATE AND DISTINCT FROM, AND IN ADDITION TO, ANY OTHER PROVISION OR SECTION IN THIS AGREEMENT, INCLUDING ANY PROVISION OR SECTION CONCERNING INDEMNIFICATION AND PROCUREMENT OF INSURANCE.

SUBCONTRACTOR EXPRESSLY WAIVES ANY RIGHT OF SUBROGATION THAT IT OR ITS INSURERS MAY HAVE AGAINST THE INDEMNIFIED PARTIES OR ANY OF THEM. THE INDEMNITY OBLIGATIONS IN THIS AGREEMENT SHALL IN NO EVENT BE LIMITED BY THE INSURANCE REQUIRED TO BE PROVIDED BY SUBCONTRACTOR OR SUB-SUBCONTRACTORS PURSUANT TO THIS AGREEMENT; NOR SHALL THE INSURANCE REQUIREMENTS OF THIS AGREEMENT BE LIMITED BY THE INDEMNITY OBLIGATIONS OF THIS AGREEMENT.

14.4 NOTWITHSTANDING THE FOREGOING, SUBCONTRACTOR SHALL NOT BE OBLIGATED UNDER THIS AGREEMENT TO INDEMNIFY AN INDEMNIFIED PARTY TO THE EXTENT SUCH LIABILITIES ARE DETERMINED BY THE TRIER OF FACT IN A FORUM OF COMPETENT JURISDICTION TO HAVE RESULTED FROM THE SOLE NEGLIGENCE OR WILLFUL MISCONDUCT OF SUCH INDEMNIFIED PARTY OR SUCH INDEMNIFIED PARTY'S OTHER INDEPENDENT CONTRACTORS, AGENTS OR EMPLOYEES.

14.5 IT IS SPECIFICALLY AGREED WITH RESPECT TO ANY LEGAL LIMITATIONS NOW OR HEREAFTER IN EFFECT AND AFFECTING THE VALIDITY OR ENFORCEABILITY OF THE INDEMNIFICATION OBLIGATION UNDER THIS SECTION, THAT SUCH LEGAL LIMITATIONS ARE MADE A PART OF THE INDEMNIFICATION OBLIGATION AND SHALL OPERATE TO AMEND THE INDEMNIFICATION OBLIGATION TO THE MINIMUM EXTENT NECESSARY TO BRING THE PROVISION INTO CONFORMITY WITH THE REQUIREMENTS OF SUCH LIMITATIONS, AND AS SO MODIFIED, THE INDEMNIFICATION OBLIGATION SHALL SURVIVE AND CONTINUE IN FULL FORCE AND EFFECT EVEN AFTER EXPIRATION OR TERMINATION OF THIS AGREEMENT.

15. <u>DISPUTE RESOLUTION:</u> If Contractor is involved in or becomes involved in litigation, arbitration, judicial reference, or other alternative dispute resolution procedure ("ADR") with a third party and Contractor or any other party joins Subcontractor as a party to such ADR, then the disputes between Contractor and Subcontractor relative to the claims involved in the ADR proceeding shall be resolved in such proceeding. In the event that Contractor is required, by law or by contract, to resolve a dispute with a third party in an ADR forum, Subcontractor agrees to participate in and be bound by such procedure, at Contractor's election.

15.1 In all other circumstances, except in California, North Carolina and Georgia, Contractor and Subcontractor agree to resolve their disputes in a court of law located in the county in which the Project is located. TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR AND SUBCONTRACTOR EACH IRREVOCABLY, UNCONDITIONALLY, KNOWINGLY AND INTENTIONALLY WAIVES ITS RIGHT TO TRIAL BY JURY.

15.2 In all other circumstances, in California, North Carolina and Georgia only, Contractor and Subcontractor agree to resolve their disputes in arbitration, and that the arbitration shall be governed by the applicable state's arbitration act, except that references to such state law made herein shall not be construed as a waiver of any rights under the Federal Arbitration Act, or any rights to have this agreement interpreted and enforced under the Federal Arbitration Act. Further, the dispute shall be administered in accordance with procedures established by the American Arbitration Association ("AAA"), except to the extent there is any conflict with the provisions herein, which shall have precedence. The arbitrator shall not have the power to commit (a) errors of law or legal reasoning, (b) errors of fact, (c) errors with regard to mixed questions of law and fact. In addition, the arbitrator shall not have the power to render an award (d) not based on substantial evidence, (e) based on evidence not presented at the hearing, or (f) not in conformity with the substantive and procedural law of the state in which the Project is located. If the arbitrator exceeds any of

the foregoing specific powers, the award may be vacated or corrected by filing a petition pursuant to the Act in the applicable court of competent jurisdiction. In reviewing the award, such court shall sit as if it were an appellate court, in all respects, including but not limited to the scope of review; provided however the decision of such court is, itself, subject to review by the appellate courts. The arbitrator shall have no power to allow or preside over any form of class proceedings, representative proceedings, or any proceeding on behalf of the general public or similarly situated persons. Further, no finding or stipulation of fact, no conclusion of law and no arbitration award in any other arbitration, judicial or similar proceeding shall be given preclusive collateral estoppel effect in any arbitration hereunder unless there is a mutuality of parties. The Parties further agree that no finding or stipulation of fact, no conclusion of law, and no arbitration award in any arbitration hereunder shall be given preclusive or collateral estoppel effect in any other arbitration, judicial, or similar proceeding unless there is a mutuality of parties. In the event arbitration is not enforced, TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR AND SUBCONTRACTOR EACH IRREVOCABLY, UNCONDITIONALLY, KNOWINGLY AND INTENTIONALLY WAIVES ITS RIGHT TO TRIAL BY JURY. Any demand for arbitration under this Agreement must be made before the statute of limitations applicable to such a claim has run.

15.3 In any litigation, arbitration, judicial reference or other ADR, excluding attorneys' fees and costs that are expressly recoverable by Contractor elsewhere in this Agreement, and notwithstanding any law allowing the award of same, both Contractor and Subcontractor agree that (i) neither party shall be entitled to recover any attorneys' fees, costs or expenses even if one party is found to be the prevailing party; and (ii) both parties expressly waive their right to recover attorneys' fees as the prevailing party.

15.4 Should a claim or controversy arise between Contractor or Owner and a Buyer of a residence regarding services performed by or through Subcontractor, Subcontractor agrees to participate as a party in, and be bound by, any procedures and requirements for remedying construction defects in accordance with applicable law, instituted by such buyer or other third party and any subsequent mediation and arbitration proceedings between Contractor or Owner and the Buyer. Subcontractor shall incorporate provisions in all agreements with its Sub-subcontractors with respect to the Work performed requiring any Sub-subcontractor to participate in, and be bound by applicable law relating to construction defects, and other procedures including mediation and arbitration.

16. <u>INDEPENDENT CONTRACTOR/AUTHORITY:</u> Subcontractor is acting as an independent contractor and not a partner or joint venturer of Contractor. In providing the Work hereunder, Subcontractor acknowledges that it shall control and direct its performance, including hours worked. Subcontractor represents and warrants that it is customarily engaged in its own independently established trade, occupation or business of the same nature as the Work provided herein, and holds itself out to the public as such. Subcontractor is solely responsible for the employment, acts, errors, omissions, control and direction of its employees, agents, and Sub-subcontractors. Nothing contained in this Agreement shall authorize or empower Subcontractor to assume or create any responsibility whatsoever, express or implied, on behalf of or in the name of Contractor, or to bind Contractor in any manner, or make representation, warranty, or commitment on behalf of Contractor, or purchase materials or otherwise incur debts in Contractor's name. Subcontractor is solely responsible for, and shall take all necessary actions for, directing, controlling and supervising its employees (including the employees' work schedule, rate, and method of payment), controlling the employment conditions of its employees, determining duration of the employment relationship with its employees, and performing all administrative functions for its employees, including supplying workers' compensation insurance and providing necessary facilities, safety equipment, vehicles, tools and materials, and maintaining employees' employment records. Subcontractor acknowledges that the compensation agreed to in each Work Agreement or Change Order thereto, were subject to negotiation between the Parties. Both Subcontractor and Contractor acknowledge that they are not joint employers.

17. CONTRACTOR REGULATION: To the extent required by law, Subcontractor warrants that it is licensed to perform the Work under this Agreement. Subcontractor shall maintain all required permits and licenses in good standing at all times.

18. CUSTOMER APPRECIATION GIFTS OR EVENTS: Contractor periodically gives its Subcontractors and Subcontractors' employees customary and nominal tokens of its appreciation, such as logo and non-logo apparel, rounds of golf, spa days, meals, materials and other "customer appreciation" gifts or outings. Subcontractor acknowledges and agrees that this is customary in the industry and does not constitute an attempt to improperly influence Subcontractor or Subcontractor's employees and does not and will not give rise to any claims for civil or criminal misconduct. Contractor fully understands that as a consequence of accepting any tokens of appreciation from Contractor, Subcontractor or Subcontractor's employees will be under no obligation to Contractor other than those contained in this Agreement. In order to ensure that Subcontractor is aware of this practice, Subcontractor expressly agrees that Contractor may, *at Contractor's sole discretion, without any obligation on the part of Contractor and without further notice to Subcontractor*, provide similar tokens of appreciation to Subcontractor or Subcontractor's employees without the need to obtain additional written or verbal consent from Subcontractor.

19. NO GIFTS: Neither Subcontractor nor any partner, director, employee, or agent of Subcontractor shall, without specific written authorization of Contractor, give to or receive from any person or entity, including without limitation, any officer or employee of any governmental or quasi-governmental agency, department, or instrumentality, any commission, fee, rebate, gift or loan of significant cost or value in connection with or as a result of Subcontractor's Work provided hereunder (excluding Gifts from Contractor pursuant to Section 18), to influence any decision, or to gain any other advantage for Contractor or Subcontractor. Subcontractor shall not (a) enter into any business arrangement with any partner or employee of Contractor, or any affiliate of same other than one acting in a capacity as a representative of Contractor or such affiliate in accordance with this Agreement and with the prior written approval of Contractor or (b) engage in any employment or enter into any contract or agreement that conflicts with Subcontractor's obligations under this Agreement. In the event of a violation of this Section, Subcontractor shall pay to Contractor any and all amounts received by Subcontractor or any other individual or entity described above, however, such payment shall not limit, or operate as a waiver of, any other legal or equitable rights which Contractor may have against Subcontractor at law, in equity, or under this Agreement. Due to the nature of this transaction and the potential exposure to various forms of fines, penalties, sanctions and other damages to Contractor's business and reputation, all of which are, at the date of executing this Agreement, impractical and extremely difficult to ascertain in advance, Contractor and Subcontractor agree that if Contractor terminates this Agreement due to the breach of this Section, then, as the monetary remedy for such breach and at Contractor's election and, as liquidated damages and not as a penalty, Subcontractor agrees that Subcontractor shall not be paid any amounts billed but unpaid for Subcontractor's compensation for Work completed prior to the termination date, as provided in Section 13. This provision shall not be construed as a waiver of Contractor's right to obtain temporary or permanent injunctive relief for any breach or threatened breach by Subcontractor of this Section. In addition to the remedies available under this Section, and at Contractor's election, Contractor shall also be entitled to injunctive remedies for breach of this Section, including without limitation, rescission.

20. STANDARDS OF BUSINESS ETHICS: To the fullest extent permitted by applicable law, Subcontractor represents that it has not and will not, and will not suffer or permit any Sub-subcontractor, employee, or agent to participate in any conduct in connection with this Agreement, any Work Agreement(s), or any Scheduling Notice(s) that violates Contractor's Code of Business Ethics and Conduct, or any successor thereto ("Contractor's Business Ethics"). By executing this Agreement, Subcontractor acknowledges receipt of Contractor's Business Ethics. Should any employee or agent of Contractor, Subcontractor, or any of its Sub-subcontractors, or any of Contractor's other trade partners engage in any conduct which Subcontractor believes violates Contractor's Business Ethics, Subcontractor shall immediately notify Contractor's representatives in writing at the address provided herein. Further, Subcontractor shall, and shall cause all Sub-subcontractors and their respective employees to, refrain from wearing, displaying (including on vehicles) or distributing any items depicting political slogans, messaging relating to social causes, or other political materials; or otherwise participating in political

activities or social activism on any Jobsite or while performing Work, except to the extent any of the above restrictions conflict with applicable law.

21. COOPERATION BY SUBCONTRACTOR: While this Agreement is in effect and after termination thereof (whether the Agreement expires on its own terms, is terminated pursuant to Section 13, or otherwise), Subcontractor agrees to reasonably cooperate with Contractor to resolve any and all disputes and/or to effectuate any and all transactions with third parties, including, without limitation, Sub-subcontractors, regulatory bodies, governmental entities, and home purchasers, related to work performed by Subcontractor pursuant to this Agreement. Subcontractor agrees reasonable cooperation includes, without limitation: (i) promptly responding to Contractor's inquiries related to such dispute or transaction, (ii) promptly providing all due diligence and/or other documents requested by Contractor that is available to or in the control of Subcontractor, and (iii) promptly executing all documents necessary to resolve such dispute or effectuate such transaction as requested by Contractor. The terms and obligations contained in this Section 21 shall survive the expiration and/or termination of this Agreement.

22. MISCELLANEOUS:

22.1 Contractor and Subcontractor acknowledge that they have read, understand, and have had the opportunity to be advised by legal counsel of their own choosing as to each and every one of the terms, conditions, and restrictions and the effect of all the provisions of this Agreement. Contractor and Subcontractor agree that the provisions shall not be construed more strictly against the party who prepared the document.

22.2 Neither this Agreement nor any Work to be performed under this Agreement, any Work Agreement(s), or Scheduling Notice(s) nor the right to payment under this Agreement shall be assigned by Subcontractor without the written consent of Contractor, which consent may be withheld at Contractor's sole discretion.

22.3 This Agreement may be freely assigned by Contractor. Subcontractor shall perform the Work and fulfill its obligations hereunder for the benefit of such assignee, so long as the assignee is making proper payment to Subcontractor. In the event of such assignment, Contractor shall be relieved of all liability accruing after such assignment. This Agreement shall be binding on the successors, heirs, and permitted assigns of the parties.

22.4 This Agreement, the related Work Agreement(s), Scheduling Notice(s), and the attached Schedules, Addenda and Change Order(s) issued by Contractor to Subcontractor embody the entire agreement between Contractor and Subcontractor and supersede any prior understandings or oral or written agreements between the parties. This Agreement, including this provision, cannot be amended except by written instrument executed by Contractor and Subcontractor. Invalidation of any term or condition of this Agreement by judgment, arbitration award, or court or otherwise shall not affect the validity or enforceability of the remaining terms and conditions

22.5 All notices and other communications hereunder, unless otherwise specifically set forth in this Agreement, shall be in writing and shall be deemed duly given (a) on the date of delivery if delivered personally, (b) on the date sent by facsimile (with confirmation of transmission) or electronic mail if sent during normal business hours of the recipient during a business day, and otherwise on the next business day, if sent after normal business hours of the recipient, provided that in the case of electronic mail, each notice or other communication shall be confirmed within one business day by dispatch of a copy of such notice pursuant to one of the other methods described herein, (c) if dispatched via a nationally recognized overnight courier service (delivery receipt requested) with charges paid by the dispatching party, on the later of (i) the first business day following the date of dispatch, or (ii) the scheduled date of delivery by such service, or (d) on the fifth business day following the date of mailing, if mailed by registered or certified mail, return receipt requested, postage prepaid to the party to receive such notice, at the addresses set forth

on the cover page of this Agreement, or such other address as a party may designate from time to time by notice in accordance with this Section.

22.6 If any provision of this Agreement is determined to be invalid, illegal, or unenforceable, the remaining provisions of this Agreement shall remain in full force and effect provided that the economic and legal substance of the transactions contemplated is not affected in any manner materially adversely to any party. In the event of any such determination, the parties agree to negotiate in good faith to modify this Agreement to fulfill as closely as possible the original intent and purposes hereof. To the extent permitted by law, the parties hereby to the same extent waive any provisions of law that render any provision hereof prohibited or unenforceable in any respect.

22.7 In no event shall either party be entitled to any interest on any sum due hereunder in excess of that permitted by applicable law. Notwithstanding anything to the contrary herein, any reference herein to interest accruing on any sum due hereunder shall be deemed to be the lower of the interest rate stated herein or the maximum rate allowed by law.

22.8 TIME IS OF THE ESSENCE IN THIS AGREEMENT. Any covenants, terms and conditions of a continuing nature shall survive final payment, completion, and acceptance of the Work under this Agreement and any applicable Work Agreement(s), and any termination or conclusion of this Agreement and Subcontractor has taken into consideration and made allowances for all the hindrances and delays incident to its Work.

22.9 This Agreement shall be deemed entered into in the state where the Project or Job Site is located and shall be interpreted and applied in accordance with the laws of the state where the Project or Job Site is located.

22.10 Subcontractor agrees to perform all of its obligations in strict accordance with the terms of this Agreement and in strict accordance with any contract and/or agreement between Contractor and any owner of the property being improved, and in complete satisfaction of such contract and/or agreement between Contractor and such owner. Such contract and/or agreement, to the extent applicable to Subcontractor's Work, shall be deemed to be a part of this Agreement.

22.11 The venue for any disputes between Contractor and Subcontractor shall be as follows: (i) Third Party Actions – If Contractor is involved in litigation or arbitration with a third party and Contractor or any other party joins Subcontractor as a party to the litigation or arbitration, Subcontractor consents to be joined in that same venue; and (ii) Other Actions or Disputes – In all other situations, venue shall be in the state and county where the Project or Job Site is located.

22.12 Upon reasonable notice, at reasonable times, and at Contractor's cost, Contractor or a third-party retained by Contractor shall have the right to access and audit Subcontractor's books, records, and documentation for the purpose of auditing Subcontractor's performance of its obligations under this Agreement, any Work Agreement(s) and any Scheduling Notice(s). Subcontractor shall cooperate by identifying and gathering documentation relating to Subcontractor's performance of its obligations.

22.13 Subcontractor shall, upon Contractor's request and at Subcontractor's cost, provide training to Contractor and its trade partners as to any product or service provided by Subcontractor. Subcontractor and Contractor shall reasonably cooperate in choosing the time, place, and frequency of such training.

22.14 By signing below, the undersigned certifies that he or she is authorized to execute this Agreement and is taking this action with full authority from the principal.

22.15 This Agreement may be executed in any number of counterparts, a complete set of which shall be deemed to be an original and all of which together shall comprise but a single instrument.

Signatures may be given via facsimile transmission or electronically and shall be deemed given as of the date of the transmission of this Agreement by facsimile or electronically to the other party.

22.16 Subcontractor acknowledges and understands that all information relating in any way to Contractor or its business or affairs, whether written or oral, obtained by Subcontractor in connection with the Work and any information regarding the nature and extent of the Work ("Confidential Information"), shall, unless otherwise specified by Contractor in writing, be deemed confidential. Furthermore, any work product created hereunder, or disclosed hereunder, unless otherwise specified by Contractor in writing, shall be considered Confidential Information. Subcontractor agrees and acknowledges that the Confidential Information shall at all times be the sole and absolute property of Contractor and no license or other rights to the Confidential Information is granted or implied hereby. Subcontractor further acknowledges and understands that Subcontractor's unauthorized disclosure of any Confidential Information would be extremely prejudicial to Contractor. Therefore, Subcontractor shall not disclose to any person or entity any Confidential Information unless such disclosure is authorized in writing by Contractor. If Subcontractor discloses or threatens to disclose Confidential Information in violation of its obligations under this Section, Contractor shall be entitled to temporary or permanent injunctive relief prohibiting the disclosure of such Confidential Information. Subcontractor may share Confidential Information with subcontractors who are similarly bound by this confidentiality provision. If Subcontractor is served with any subpoena or other legal process seeking the compelled disclosure of Contractor's Confidential Information, Subcontractor shall notify Contractor within twenty-four (24) hours after Subcontractor's receipt of such legal process. Contractor may, in its sole and absolute discretion and at Contractor's sole expense, contest the disclosure of such Confidential Information sought under such legal process. Only after a final order of a court of competent jurisdiction requiring the disclosure of such Confidential Information may Subcontractor disclose such Confidential Information as advised by its counsel is required by such order. This prohibition of disclosure of Confidential Information shall survive the termination of this Agreement. To the fullest extent permitted by law, Subcontractor hereby agrees to indemnify, defend and hold Contractor and its affiliates, partners, employees and agents harmless from any and all loss, damage or liability which results from or arises in connection with Subcontractor's breach of its obligations under this Section. Nothing in this section shall be construed to negate, abridge or otherwise reduce any rights of Contractor under contract or statute.

23. <u>SPECIAL PROVISIONS FOR PUBLIC WORKS/PREVAILING WAGE WORK:</u> If any Work Agreement issued pursuant to this Agreement is in whole or in part for Work that is considered a "public works" project or otherwise subject to public contracting provisions or prevailing wage laws or regulations, then such Work Agreement shall be subject to the following provisions, and Subcontractor agrees it shall comply with, the following provisions:

23.1 In accordance with applicable state public works and prevailing wage laws, Subcontractor shall be responsible for compliance with all prevailing wage requirements and adherence to all labor standards and regulations by Subcontractor and any Sub-subcontractors.

23.2 In addition to the provisions of Section 1.5, Subcontractor shall furnish all labor, materials, equipment, supplies, supervision, and all other things necessary to timely and properly perform the Work in a good and workmanlike manner, in strict accordance with the applicable state building code, and the requirements of Part 1, Section 1 and Parts 2, 3 and 4 of the current edition of Standard Specifications for Public Construction, if and as applicable, both as amended from time to time, or any successor regulations, if and as applicable.

23.3 Subcontractor and all Sub-subcontractors shall maintain accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the Work, in accordance with, generally accepted accounting principles and procedures, consistently applied, and shall preserve

such records for the period of time required by the applicable state public works/prevailing wage laws, but in any event not less than five (5) years after Subcontractor's receipt of final payment of any compensation paid under the applicable Work Agreement. Each payroll record maintained by Subcontractor and any Sub-subcontractors with respect to such Project/Job Site shall include a written declaration in compliance with state prevailing wage/public works laws, as amended from time to time, or any successor statutes, and shall comply in full with the record-keeping, certification, and other requirements stated therein.

23.4 As used herein, the prevailing rate of hourly and daily wages ("Prevailing Rate") shall mean the prevailing rate for the county in which the public work is located as determined in the manner set forth in the applicable state prevailing wage/public works law, as amended from time to time, or any successor or applicable statutes. Subcontractor and any Sub-subcontractors shall pay all workers employed for any portion of the Work not less than the Prevailing Rate.

[Signatures on following page]

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

Lennar Homes of Texas Land and Construction, LTD

_____

"Contractor"

By: _____

Name: _____

Title: _____

<INSERT PROPER ENTITY NAME>

_____

"Subcontractor"

By: _____

Name: _____

Title: _____

Address: _____

By: _____

Name: _____

Title: _____

Address: _____

Fed. I.D. No.: _____

License No.: _____

SCHEDULE "1"
TO LAND BASE MASTER TRADE PARTNER AGREEMENT

Lennar Homes of Texas Land and Construction, LTD

WORK AGREEMENT No. _____

TO LAND BASE MASTER TRADE PARTNER AGREEMENT No. _____

CONTRACTOR'S STATE LICENSE No: _____
SUBCONTRACTOR'S STATE LICENSE No: _____

REGIONAL OPERATIONS CENTER: _____

DIVISION OFFICE: _____

WORK DESCRIPTION: _____

OWNER: _____

CONSTRUCTION LENDER: _____

PROJECT NAME: _____

WORK AGREEMENT AMOUNT: _____$_____

This Work Agreement to the Land Base Master Trade Partner Agreement (the "Work Agreement") is entered into [DATE] by and between Lennar Homes of Texas Land and Construction, LTD ("Contractor"), whose address is 100 NE Loop 410, 1155, San Antonio, Texas 78216, and telephone number is 210.403.6200, and [SUBCONTRACTOR COMPANY NAME] ("Subcontractor"), whose address is [SUBCONTRACTOR ADDRESS] , and telephone number is [SUBCONTRACTOR TELEPHONE].

RECITALS

A. Contractor and Subcontractor entered into that certain Land Base Master Trade Partner Agreement on or about [EXECUTION DATE OF GOVERNING MTPA], Contract No. [CONTRACT NO.] (the "Agreement"). As used herein, and except as hereby expressly provided, all capitalized words and phrases shall have the same meanings as defined in the Agreement.

B. Contractor desires to have Subcontractor perform work within the Project referenced above (the "Project") as set forth in Subcontractor's bid package for the Project, which was submitted to Contractor via Contractor's electronic bid system, and is hereby approved by Contractor and incorporated herein by reference (the "Work").

C. Contractor and Subcontractor desire to amend the Agreement as more particularly set forth herein.

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the foregoing recitals, and the covenants and conditions contained herein, and for other good and valuable consideration, the receipt of which is hereby acknowledged, Contractor and Subcontractor hereby agree to amend the Agreement as follows:

1. Contractor's Scope of Work is set forth in Exhibit "A" hereto.

2. The Project Location shall be as set forth in Exhibit "B" hereto.

4. The List of Sub-subcontractors shall be as set forth in Exhibit "C" hereto.

5. The Plans and Specifications for the Work shall be as set forth in Exhibit "D" hereto.

6. The Construction Schedule shall be as set forth in Exhibit "E" hereto.

7. Work approved for construction is set forth in Subcontractor's bid package for the Project described above.

8. Prior to commencing the Work, Subcontractor shall comply with all insurance requirements set forth in Schedule "4" to the Agreement which requirements are incorporated herein by this reference as though set forth herein, including, without limitation and if applicable, the "OCIP Addendum" if attached thereto. If the "Insurance Requirements" are added to or amended by this Work Agreement, they are set forth in the "Modified Insurance Requirements" attached hereto as Exhibit "G".

9. The Pricing Schedule attached hereto shall be effective on the date set forth above. Any changes to the Work, or the Pricing Schedule, shall become effective only upon execution by all parties hereto of an amendment to the Work Agreement (the "Amendment"). Subcontractor Rates and Rental Rates are as set forth in Exhibit "H" hereto.

10. Contractor may, from time to time, issue written notices to proceed/purchase order requests identifying specific locations on which the Work is to be performed ("Scheduling Notice", "Received Order", or "Notice to Proceed"). Contractor shall have no obligation to issue any Scheduling Notice(s) during the term of this Work Agreement. **THIS WORK AGREEMENT IS NOT AN AUTHORIZATION TO PROCEED WITH WORK, AND SHALL NOT BECOME EFFECTIVE WITH RESPECT TO THE WORK OF SUBCONTRACTOR UNLESS AND UNTIL CONTRACTOR ISSUES SCHEDULING NOTICE(S) TO SUBCONTRACTOR AUTHORIZING THE SPECIFIC WORK OF SUBCONTRACTOR TO BE PERFORMED, AND THIS WORK AGREEMENT SHALL BE BINDING ONLY AS TO THE WORK SO AUTHORIZED BY CONTRACTOR. SUBCONTRACTOR SHALL PERFORM NO WORK WITHOUT RECEIVING CONTRACTOR'S WRITTEN SCHEDULING NOTICE(S) FOR SUCH WORK. SUBCONTRACTOR AGREES TO COMMENCE SUCH WORK AS MAY BE AUTHORIZED BY CONTRACTOR BY MEANS OF EACH SCHEDULING NOTICE(S), AND SUCH SCHEDULING NOTICE(S) SHALL BE EFFECTIVE IMMEDIATELY UPON ISSUANCE BY CONTRACTOR WITHOUT NEED FOR FURTHER ACCEPTANCE THEREOF BY SUBCONTRACTOR.** If the Work authorized by a Scheduling Notice is not commenced on the date specified in the Scheduling Notice, Contractor may, in its sole discretion, declare such Scheduling Notice null and void. Contractor may, but shall not be obligated to, furnish Subcontractor with a progress schedule for all or any portion of the Work which, if furnished, may be amended from time to time by Contractor and shall be considered a part of this Work Agreement. Subcontractor acknowledges that neither this Work Agreement nor the issuance by Contractor of a progress schedule constitute any representation by Contractor that a minimum or specified number of Scheduling Notices will be issued. As to that portion of the Work

covered by a Scheduling Notice, such schedule shall control over any other provision of this Work Agreement or progress schedule regarding time for performance.

Except to the extent the Agreement is supplemented by this Work Agreement or such other Work Agreements that may have been entered into by the parties hereto pursuant to the Agreement, the terms and conditions of the Agreement shall remain unmodified and in full force and effect. In the event of conflict between the terms and conditions of the Agreement and the terms and conditions of this Work Agreement, the terms and conditions of this Work Agreement shall prevail, but only with respect to the Work covered hereby.

IN WITNESS WHEREOF, the parties hereto have executed this Work Agreement as of the day and year first above written.

Lennar Homes of Texas Land and Construction, LTD.
"Contractor"

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

License No.: _____

[-Insert Subcontractor Company Name-]
"Subcontractor"

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

Fed. I.D. No.: _____

License No.: _____

Exhibits to Work Agreement

Exhibit “A” Scope of Work
Exhibit “B” Project Location
Exhibit “C” List of Sub-subcontractors
Exhibit “D” Plans and Specifications
Exhibit “E” Construction Schedule
Exhibit “F” Modified Insurance Requirements / OCIP Exhibit (if applicable)
Exhibit “G” Subcontractor Rates and Rental Rates

EXHIBIT “A” TO SCHEDULE “1” WORK AGREEMENT
SCOPE OF WORK

Work included in this Project is comprised of site excavation and embankment, import of fill with embankments, site grading, on-site storm drainage system with piping, junction boxes, grate inlets, curb inlets, concrete paving, security fencing and gates, sanitary sewer piping and manholes, temporary potable water service, segmented retaining walls to heights of 25’, tree protection, traffic control, testing and laboratory services, site cleanup and seeding of disturbed areas.

EXHIBIT “C” TO SCHEDULE “1” WORK AGREEMENT
PROJECT LOCATION

The project’s physical address is 3528 Millbrook Way, located in southwest Bexar County one-quarter mile south of the intersection of Ladera Hills and West Grosenbacher Road within the Ladera Development located approximately 2.25-miles north of the intersection of US Hwy 90 and SH 211 in Southwest Bexar County.

The site is formally described as Lot 217, Block 35, of Millbrook Unit 1A as recorded in the Real Property Records of Bexar County, Tx.

EXHIBIT “D” TO SCHEDULE “1” WORK AGREEMENT
LIST OF SUB-SUBCONTRACTORS

(Labor, Materials, Equipment, Supplies and/or Supervision)

List below the name and business address of each Sub-subcontractor approved by Contractor who will perform any portion of the Work under the Agreement. Also list the portion of the Work which will be done by such Sub-subcontractor. The listing of more than one Sub-subcontractor for each item of Work to be performed with the words "and/or" is not permitted.

WORK TO BE PERFORMED	% OF TOTAL CONTRACT	SUB-SUBCONTRACTOR'S NAME AND ADDRESS

Number	Firm Name	Specialty	Estimated Value

EXHIBIT "E" TO SCHEDULE "1" WORK AGREEMENT
PLANS AND SPECIFICATIONS

REFER TO PLANS AND SPECIFICATIONS PREPARED BY PAPE-DAWSON ENGINEERS, LLC ENTITLED

LADERA WATER PRODUCTION FACILITY
SITE WORK CONSTRUCTION

EXHIBIT “F” TO SCHEDULE “1” WORK AGREEMENT
CONSTRUCTION SCHEDULE

<INSERT SUBCONTRACTOR’S SCHEDULE FOR PROJECT>

EXHIBIT "G" TO SCHEDULE "1" WORK AGREEMENT
MODIFIED INSURANCE REQUIREMENTS / OCIP EXHIBIT (if applicable)

SUGGESTED MINIMUM LIMITS	
WORKMAN'S COMPENSATION	$1,000,000
EMPLOYER'S LIABILITY	$1,000,000

COMPREHENSIVE GENERAL LIABILITY AND PROPERTY DAMAGE INSURANCE $2,000,000

COMPREHENSIVE AUTOMOBILE LIABILITY AND PROPERTY DAMAGE INSURANCE $500,000

EXHIBIT “H” TO SCHEDULE “1” WORK AGREEMENT
SUBCONTRACTOR RATES AND RENTAL RATES

In the event that additional work is undertaken which is not covered by the Agreement and Subcontractor elects to proceed on a "time and material" or cost plus basis, the rates provided below shall prevail. Rates shall include all labor and equipment to complete the Work. The rates shall be billing rates, with no further markups to be added, and all equipment shall include fuel, lubrication, operation and all maintenance. No overtime premium will be paid on equipment. Subcontractor’s performance of any such work on a "time and material" or cost plus basis shall be subject to the provisions of Section 11 of the Agreement.

SCHEDULE "2"
TO LAND BASE MASTER TRADE PARTNER AGREEMENT

NOTICE TO PROCEED/SCHEDULING NOTICE

Notice is hereby given by Contractor's Representative that on this [DATE], [SUBCONTRACTOR COMPANY NAME] ("Subcontractor"), is directed to commence construction of Work pursuant to Work Agreement No. [WORK AGREEMENT NO.], under Land Base MTPA Contract No. CONTRACT NO.] ("Agreement"), as described below:

_____

_____

_____

Subcontractor has [INSERT NUMBER OF DAYS] working days from the date written above within which to complete the Work as set forth above. Time is of the essence with respect to the Agreement and, accordingly, Subcontractor promises to complete the Work within the specified period of time or be liable for liquidated damages, as stipulated in the Agreement.

Agreed to and accepted on [DATE].

[ENTER SUBCONTRACTOR COMPANY NAME]

_____

By: _____

Name: _____
Title: _____

LENNAR HOMES OF TEXAS LAND AND CONSTRUCTION, LTD

_____

By: _____

Name: _____
Title: _____

SCHEDULE "3"
TO LAND BASE MASTER TRADE PARTNER AGREEMENT

JOB RULES

1. Notwithstanding any contrary language in any agreement between Subcontractor and any third person, including any labor organization, neither Subcontractor nor any Sub-subcontractor shall allow any person access to the Project/Job Site unless they are directly and actively engaged in the performance of the Work. No unauthorized persons (e.g., members of the general public, off-duty employees, family members, solicitors, visitors, vendors, sales persons, officials of labor organizations, prospective homeowners, etc.) shall be allowed on the Project or Job Site without Contractor's written consent. Access by any unauthorized person shall be considered unlawful trespass and a material breach of this Agreement.

2. Hard-hats, eye and hearing protection, proper scaffolding, equipment safety devices, and all other appropriate clothing and safety devices are required at all times and in all locations at the Project or Job Site for Subcontractor and any Sub-subcontractor. If Subcontractor observes any other Subcontractor violating this requirement, Subcontractor shall immediately report such violation to Contractor.

3. **CONSUMPTION OF ALCOHOL OR ILLEGAL SUBSTANCES EITHER BEFORE OR DURING PERFORMANCE OF THE WORK IS CAUSE FOR IMMEDIATE SUSPENSION OF WORK AND TERMINATION OF THIS AGREEMENT.** Subcontractor shall not allow any person acting by, through or under Subcontractor to be on the construction site or perform any part of the Work (a) while under the influence of alcohol or any drugs or controlled substances, or (b) if there is (i) any suspicion of alcohol or drug use, possession, or impairment involving such employees, agents, or Sub-subcontractors, or (ii) an incident where drug or alcohol use could have been a contributing factor. Contractor may require Subcontractor to remove any person that Contractor reasonably suspects is in any way impaired and, in such case, such person may only be considered for return to work after Subcontractor certifies as a result of a for-cause test, conducted immediately following removal, that person was in compliance with this Agreement. Subcontractor shall not allow on the Job Site any person that either refuses to take, or tests positive in, any alcohol or drug test. Contractor may, without prior notice, search or require Subcontractor to search the person, possessions, and vehicles of any person acting by, through or under Subcontractor that are on the Job Site or any premises owned, controlled, or managed by Contractor. Any person who refuses to cooperate with such search will be immediately removed from the premises and not allowed to return. Subcontractor will comply with all applicable federal, state, and local drug and alcohol related laws and regulations (e.g., Department of Transportation regulations, Department of Defense Drug-Free Workforce Policy, Drug-Free Workplace Act of 1988). Contractor may perform unannounced audits of Subcontractor's alcohol and drug program to verify that Subcontractor's policy and its enforcement are acceptable to Contractor. In addition, possession of alcohol, drugs, illicit or unprescribed controlled substances, firearms, explosives, weapons, and hazardous substances or articles is not permitted on the Job Site or other premises owned, controlled, or managed by Contractor. Contractor does not warrant or represent that Subcontractor's policy meets the requirements of any applicable law, code, rule or regulation, nor does Contractor warrant that the proper enforcement of Subcontractor's policy will ensure that no accidents or injuries will occur. In addition, any action taken or not taken by Contractor under this Paragraph shall not diminish or affect any of Subcontractor's obligations under applicable law or this Agreement, or Subcontractor's status as an independent Subcontractor.

4. Subcontractor and its employees, agents, and Sub-subcontractors shall not speed or otherwise operate their automobiles in a dangerous or offensive manner within the Job Site, and shall otherwise comply with all traffic laws, ordinances, rules or regulations. The speed limit within the Job Site is 5 MPH.

5. Subcontractor will provide portable toilet facilities for the use of Subcontractor's employees.

6. Contractor shall have the right to control or restrict parking of all vehicles and equipment on the Project/Job Site, and Subcontractor shall comply with any such parking restrictions.

7. Subcontractor shall not interfere with the free vehicular and pedestrian access through any public or private streets and driveways on the Project/Job Site or located in the vicinity of the Project/Job Site.

8. Subcontractor shall not perform any additional work for any third party without prior written approval from an officer of Contractor at the office address listed in this Agreement. Non-approved work will be removed or replaced at Subcontractor's expense. Continued violation of this rule may result in the termination of this Agreement.

9. Neither Subcontractor nor any Sub-subcontractor shall, without specific prior written authorization of Contractor's Regional President, give or receive any commission, fee, rebate, gift, loan or anything else of value to (a) any person or entity, including without limitation any agent or employee of a governmental authority, in connection with or as a result of Subcontractor's Work provided hereunder, to influence any decision or gain any other advantage for Contractor or Subcontractor, or (b) any agent or employee of Contractor. Neither Subcontractor nor any Sub-subcontractor shall, without prior written authorization of Contractor's Regional President, enter into any business arrangement with any agent or employee of Contractor, or any affiliate of any agent or employee of Contractor. No agent or employee of Contractor is authorized to engage in any employment or enter into any contract or agreement that conflicts with Subcontractor's obligations under this Agreement. Subcontractor shall immediately notify the Contractor Legal Department in Miami, Florida, if any agent or employee of Contractor requests or suggests that Subcontractor provide anything of value in violation of this Paragraph, or should Subcontractor believe or have reason to believe that an agent or employee of Contractor expects to receive, directly or indirectly, anything of value.

SCHEDULE "4"
TO LAND BASE MASTER TRADE PARTNER AGREEMENT

INSURANCE

[-Insert insurance requirements-]

[-This is a sample-]

SCHEDULE "5"
TO LAND BASE MASTER TRADE PARTNER AGREEMENT

[-INSERT LENNAR ENTITY NAME-]
CHANGE ORDER NO. _____

TO WORK AGREEMENT NO. _____

TO LAND BASE MASTER TRADE PARTNER AGREEMENT NO. _____

CONTRACTOR'S STATE LICENSE NO. _____

[This sample "Schedule 5–Change Order" is for demonstration purposes only. In practice, this change order shall be implemented as a separate document.]

REGIONAL OPERATIONS CENTER: _____
DIVISION OFFICE: _____
WORK DESCRIPTION: _____
OWNER: _____
CONSTRUCTION LENDER: _____
PROJECT NAME: _____
WORK AGREEMENT AMOUNT: $ _____
PREVIOUS CHANGE ORDERS: $ _____
THIS CHANGE ORDER: $ _____
REVISED CONTRACT AMOUNT: $ _____

This Change Order No. _____ to the Work Agreement No. _____ (the "Work Agreement") is entered into as of [DATE], by and between [LENNAR ENTITY NAME] ("Contractor"), whose address is [LENNAR ADDRESS], and telephone number is [LENNAR TELEPHONE], and [SUBCONTRACTOR COMPANY NAME] ("Subcontractor"), whose address is [SUBCONTRACTOR ADDRESS], and telephone number is [SUBCONTRACTOR TELEPHONE].

RECITALS

A. Contractor and Subcontractor entered into that certain Land Base Master Trade Partner Agreement No. _____ on or about [MTPA EXECUTION DATE] ("MTPA"). Pursuant to the MTPA, Contractor and Subcontractor executed Work Agreement No. _____, dated _____ ("Work Agreement") pursuant to which Subcontractor was to perform certain Work in connection with the Project set forth above. As used herein, and except as hereby expressly provided, all capitalized words and phrases shall have the same meanings as defined in the MTPA and the Work Agreement.

B. Contractor and Subcontractor desire to amend the Work Agreement as more particularly set forth herein.

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the foregoing recitals, and the covenants and conditions contained herein, and for other good and valuable consideration, the receipt of which is hereby acknowledged, Contractor and Subcontractor hereby agree to amend the Work Agreement as follows:

1. The Work Agreement is amended as follows: _____.

Change Order No.:_____, dated: _____
Description: _____

	Cost Code	Description	Unit of Measure	Quantity	Unit Price	Extension
1						
2						
3						
4						
5						
					Subtotal	**$**

2. The cumulative total cost of the Work to be performed pursuant to the Work Agreement is as follows:

Work Agreement Amount	$	
Previous Change Orders	$	
This Change Order	$	
Revised Contract Amount	$	

The Work Agreement shall remain in full force and effect, as amended hereby. Hereinafter, all references to the Work Agreement shall be deemed to refer to the Work Agreement as amended as of the date hereof.

[Remainder of page intentionally left blank - signature page follows.]

IN WITNESS WHEREOF, the parties hereto have executed this Change Order as of the day and year first above written.

[-Insert Lennar Entity Name-]
"Contractor"

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

License No.: _____

[-Insert Subcontractor Company Name-]
"Subcontractor"

By: _____

Name: _____
Title: _____

By: _____

Name: _____
Title: _____

Fed. I.D. No.: _____
License No.: _____

SECTION 00 7100

CONTRACTING DEFINITIONS

PART 1 GENERAL

1.01 APPLICABILITY: These definitions are integral to the Agreement.

1.02 DEFINITIONS - DESIGN-BUILD DOCUMENTS

A. Contract Documents: As defined in the Conditions of the Contract and as follows:
   1. At the time of execution of the Agreement, Contract Documents consist of the following:
      a. The Agreement and Conditions of the Contract, and other documents listed on the Table of Contents under the heading Contracting Requirements.
   2. From time to time after execution of the Agreement, upon approval by the Owner, the following types of documents will be incorporated into Contract Documents:
      a. Drawings and other documents documenting the design.
      b. Construction drawings and specifications detailing the execution of the design.

B. Project Program: The Owner's requirements for size, arrangement, organization, and location of functional spaces, description of space functions, identification of fittings, equipment, and furnishings, description of the physical and environmental requirements for each space, together with a description of the image, goals, or "mission" of the project.

1.03 DEFINITIONS - TIME PERIODS AND MILESTONE DATES

A. Construction: The time period from the beginning of work on the project site until final payment is made.

B. Substantial Completion: The date as defined in the Conditions of the Contract. Date of Substantial Completion is the due date for the following:
   1. Engineer’s complete punchlist of items to be completed.
   2. Owner's complete punchlist of items to be completed.
   3. Submittal of all record drawings, surveys, final quantities, releases of all liens, and required documentation as noted elsewhere in these specifications.
   4. Compliance with requirements of governing authorities, for submittals, inspections, and permits.
   5. Compliance with Owner's requirements for access to areas occupied by the Owner.

C. Closeout: The time period during which all details of construction is completed.
   1. The Closeout period is the time from Date of Substantial Completion until final payment, both as defined by the Conditions of the Contract.
   2. Before and during the Closeout period, the Owner will ascertain whether the completed project complies with Contract Documents.

D. Occupancy: The time period during which the project is occupied for its intended purpose.
   1. The Occupancy period begins at Date of Substantial Completion, as defined by the Conditions of the Contract.

E. Correction Period: The time period defined by the Conditions of the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1413

ACCESS TO SITE

1.00 GENERAL

1.01 HIGHWAY LIMITATIONS

A. The Contractor shall make their own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the sites of the work. It shall be the Contractor's responsibility to construct and maintain any haul roads required for its construction operations. The Contractor shall make access to all work areas within one 30-foot wide corridor to the site from an existing public roadway.

1.02 TEMPORARY CROSSINGS

A. Temporary Bridges: Wherever necessary, to maintain vehicular crossings, the Contractor shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the Contractor shall secure the written consent of the responsible individuals or authorities to omit such temporary bridges or steel plates, which written consent shall be delivered to the Engineer prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the Contractor shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

B. Street Use: Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alleyway, or parking area during the performance of the work hereunder, and it shall conduct its operations to not interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the Owner and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the Owner or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

C. Traffic Control: For the protection of traffic in public or private streets and ways, the Contractor shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).

1. The Contractor shall take all necessary precautions for the protection of the work and the safety of the public. Barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The Contractor shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. Signs, signals, and barricades shall conform to the requirements of the OSHA Safety and Health

Standards for Construction.

2. The Contractor shall submit traffic control plan to the Owner for approval a minimum of 2 weeks prior to construction. The Owner shall be allowed access to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes required by the Owner shall supersede these plans and be done solely at the Contractor's expense.
3. The Contractor shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

1.03 CONTRACTOR'S WORK AND STORAGE AREA

A. The Owner will designate and arrange for the Contractor's use, a portion of the property for its exclusive use during the term of the Contract as a storage and shop area for its construction operations on the work. At the completion of the work, the Contractor shall return this area to its original condition, including grading and landscaping.

B. The Contractor shall make its own arrangements for any necessary off- site storage or shop areas necessary for the proper execution of the work.

C. Lands to be furnished by the Owner for construction operation and other purposes are indicated in the Contract Drawings. Should the Contractor find it necessary to use any additional land for other purposes during the construction of the work, it shall arrange for the use of such lands at its own expense. The limits of each work site shall be fenced and gated to prevent intrusion and will be restored to original grade.

D. The Contractor shall construct necessary onsite roads for access to the drilling site and the drilling site pad.

E. The Contractor shall designate and use an area for hazardous materials used in constructing the work.

For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

1. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.
2. The Contractor shall develop and submit to the Engineer a plan for storing and disposing of the materials above.
3. The Contractor shall obtain and submit to the Engineer a single EPA number for wastes generated at the site.
4. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.

1.04 PARKING

A. The Contractor shall:

1. Provide temporary parking areas within the facility, at the drilling site.

2. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The Contractor shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

END OF SECTION

SECTION 01 2000

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. Section 00 5000 - Contracting Forms and Supplements.

B. Document 00 5200 - Agreement Form .

C. Document 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions.

D. Document 00 7300 - Supplementary Conditions.

E. Section 01 2100 - Allowances.

F. Section 01 2200 - Unit Prices.

G. 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 draft to Engineer for approval.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

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.

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 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 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 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. Document any requested substitutions in accordance with Section 01 6000.

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 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

SECTION 01 2100
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 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.

1.04 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.

1.05 ALLOWANCES SCHEDULE

A. Bid item 27 – Temporary water service -Include the stipulated sum of $15,000 for costs associated with the purchase and use of potable water from SAWS for construction.

B. Bid item 28 – Miscellaneous construction Permits and inspection fees - Include the stipulated sum of $ 10,000 for securing and maintaining local permits for construction of the project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200

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 complying with 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders.

B. Document 00 4323 - Alternates Form.

C. Document 00 5200 - Agreement Form.

1.03 ACCEPTANCE OF Alternates

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF Alternates

A. Alternate No. ____ - _____:
   1. Base Bid Item: Section _____ and Drawing number ____ including _____.
   2. Alternate Item: Section _____ and Drawing number ____ including _____.

B. Alternate No. ____ - _____:
   1. Base Bid Item: Section _____ and Drawing number ____ including _____.
   2. Alternate Item: Section _____ and Drawing number ____ including _____.

C. Alternate No. ____ - _____:
   1. Base Bid Item: Section _____ and Drawing number ____ including _____.
   2. Alternate Item: Section _____ and Drawing number ____ including _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000

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 - General Conditions.

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 COORDINATOR

A. Cooperate with the Contractor’s 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 Engineer and Owner'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 Engineer for use of temporary utilities and construction facilities.

E. Coordinate field engineering and layout work under instructions of the Contractor, Engineer and Owner.

F. Make the following types of submittals to Engineer through the Contractor’s 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, MS Word, or MS Excel) format, as appropriate to the document, 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 Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, 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 allowable format.
   4. Subcontractors, suppliers, and Engineer's consultants are to 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 electronic 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 Contractor.

C. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

D. Training: One, 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.

E. 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. Engineer will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Engineer.
   3. Contractor.

C. Contractor will schedule and administer a pre-construction meeting within 15 days after date of Notice to Proceed.

D. Location: Office of the Engineer at 911 Central Pkwy North, Suite 400, San Antonio, Tx. 78232.

E. Attendance
   1. Owner's Representative.
   2. Engineer's Representative.
   3. Contractor's Superintendent.
   4. Others as appropriate.

E. Agenda:
   1. Review of the Executed Owner-Contractor Agreement.
   2. Confirmation of list of subcontractors, list of products, schedule of values, and progress schedule.
   3. Designation of personnel representing the parties to Contract.
   4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   5. Initial project schedule and milestone dates.
   6. Presentation of traffic control plan.
   7. Scheduling activities of Subcontractors.
   8. Review of submittal procedures.
   9. Procedures for testing.
   10. Procedures for maintaining record documents.
   11. Processing of applications for payment.
   12. Critical work sequencing.
   13. Equipment and supply deliveries.
   14. Storage areas, security housekeeping and Owner's needs.

F. The Engineer will prepare meeting minutes and distribute copies within three days after meeting to participants, with copies each to Owner, Contractor and meeting 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. Others as invited by Owner and/or Engineer.

C. Agenda:
   1. Reviews of the Use of premises by Owner and Contractor.
   2. Reviews of the Owner's requirements.
   3. Construction facilities and controls provided by Contractor.
   4. Temporary utilities provided by Contractor.
   5. Survey and project layout.

6. Security and housekeeping procedures.
7. Updated project schedule as appropriate.
8. Inspection and acceptance of utilities, stormwater improvements, and SWPPP facilities put into service during construction period.

D. 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.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

D. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, Engineer, as appropriate to agenda topics for each meeting.

E. 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.

F. 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. If preliminary schedule requires revision after review, submit revised schedule within five days.

C. Within five 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.

D. Within three days after joint review, submit complete schedule.

E. Submit updated schedule every 14 days.

3.06 PROGRESS PHOTOGRAPHS

A. Submit new photographs monthly with each application for payment. Failure to provide photographs with each application for payment will result in delay of Engineer's approval until photographs are received and approved by Engineer.

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 2 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.

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 compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed 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. Sustainability design 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. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. 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.

D. 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 two copies that will be retained by Engineer.
2. Larger Sheets, Not Larger Than 22 x 34 inches: Submit the number of copies that Contractor requires, plus one copy that will be retained by Engineer.

B. Documents for Information: Submit one copy.

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

D. Samples: Submit the number specified in individual specification sections; one 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. General Requirements:

B. Transmit each submittal with approved form.

END OF SECTION

SECTION 01 3050.10

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1-GENERAL

1.01 SUBMITTALS

A. All submittals shall originate from the Contractor.

B. Submit one (1) complete electronic copy (PDF format) of all Shop Drawings until final acceptance. One (1) electronic file print will be returned to the Ccontractor after each Engineer's review. Submittals received from others will be returned without comment.

C. Submit electronic (PDF format) of all Product Data until final acceptance. One (1) electronic file of the Pproduct Data will be returned to the Contractor after Engineer's review.

D. Submit a minimum of duplicates of all Samples as directed by the Engineer. Additional samples may be required for specific items for coordination of finishes.

E. Submit additional electronic (PDF format) 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.

F. Contractor shall review, provide a date stamp with his signature approval for all submittals. Any submittals which do not bear the Contractor's approval stamp and signature shall be returned without review.

G. Where printed materials describe more than one product or model, clearly identify which is to be furnished.

H. Shop Drawings shall not be reproductions of Contract Documents.

I. 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.

J. 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.

K. 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.

L. Submit preliminary schedule of Shop Drawing and Sample Submittals within 15 days after Pre-Construction Conference.

END OF SECTION

SECTION 01 3119.10

PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRE-CONSTRUCTION MEETING

A. The Engineer will schedule and administer a pre-construction meeting within 15 days after date of Notice to Proceed.

B. Location: At the office of the Engineer.

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

SECTION 01 3216

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 and with each Application for Payment.

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 where appropriate.

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 projected 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 Engineer 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

SECTION 01 3217

DAILY CONSTRUCTION PROGRESS REPORT

PART 1 - GENERAL

1.01 CONTRACT

A. The Contractor shall maintain and prepare Daily Reports for construction progress and submit to the Engineer with each monthly pay request. The Daily Reports shall provide 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.
   6. Identify if no work was performed and why (weather, equipment issues, etc.).

B. Contractor shall submit electronic copies of daily reports with each pay application to the Owner.

END OF SECTION

SECTION 01 3233.10

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 CONSTRUCTION PHOTOGRAPHS

A. Construction progress photographs shall be taken at a minimum of twice per month at intervals not to exceed fourteen (14) days, 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. All photographs shall be identified with Project name, date, location and view of vantage point.

D. Furnish one (1) set of electronic prints of all photographs to the Engineer to accompany each Application for Payment.

E. All photographs shall be retained by the Contractor until the completion of the Project, at which time they shall be delivered to the Engineer and shall become the property of the Owner.

END OF SECTION

SECTION 01 3553

SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control, guard service, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls.

1.03 SECURITY PROGRAM

A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner or Engineer on request.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Testing and inspection agencies and services.

D. Control of installation.

E. Tolerances.

F. Manufacturers' field services.

G. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information.

B. Document 00 7200 - General Conditions.

C. Section 01 2100 - Allowances.

D. Section 01 3000 - Administrative Requirements.

E. Section 01 4216 - Definitions.

F. Section 01 6000 - Product Requirements.

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 3050.10 – Shop Drawings, Product data and Samples for submittal procedures.

B. Design Data: Submit for Engineer's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit one copy of report to the 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. Compliance 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 compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. 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.

E. 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.

F. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
1. Submit report in electronic format (PDF) within fourteen (14) days of observation to Engineer for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance 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. Comply with reference standard of date of issue current on date of Contract Documents, 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 Contract Documents by mention or inference otherwise in any reference document.

1.06 Testing and Inspection Agencies and Services

A. Owner will employ and pay for a services of an independent testing agency to perform testing and inspections on its behalf. Contractor shall provide full access to Owner' testing agency during the construction period.

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-compliance 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 and to manufacturers' facilities.
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-compliance with specified requirements shall be performed by the same agency on instructions by Engineer.

F. Re-testing required because of non-compliance with 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 and to initiate instructions when necessary.

B. Submit qualifications of observer to Engineer fourteen (14) 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 complying with 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

SECTION 01 4216

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-do-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. AWPA 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

SECTION 01 4529

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 PAYMENT

A. Contractor will obtain testing as required to demonstrate the work is completed per plans and specifications at no additional cost to the Owner.

B. The Contractor shall allow access by the Owner and/or Engineer should there be any additional testing requested by and paid for by the Owner such as Special Inspections.

1.2 WORK INCLUDED

Testing is required for the following items of work:

A. Soils compaction control.

B. Pile load tests.

C. Concrete paving.

D. Concrete reinforcement.

E. Cast-in-place concrete.

F. Precast, prestressed concrete.

G. Mortar.

H. Pipe Steel Welding.

I. Protective Coating Testing

J. Piping Disinfection

K. Hydrostatic Testing

L. Coating Testing

M. Weld Testing

1.3 TESTING LABORATORY QUALIFICATIONS

A. Standards.

B. Meet “Recommended Requirements for Independent Laboratory Qualification,” latest edition, publishedby American Council of Independent Laboratories.

C. Meet basic requirements of ASTM E 329, “Standards of Recommended Practice for Inspection andTesting Agencies for Concrete and Steel as Used in Construction.”

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of NationalBureau of Standards during most recent tour of inspection; with memorandum of remedies of any deficiencies reported by inspection.

E. Testing Equipment.

F. Calibrate at maximum 12-month intervals by devices of accuracy traceable to either the NationalBureau of Standards or accepted values of physical constants.

G. Submit copy of certificate of calibration, made by accredited calibration agency.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel; provide access to the work or to manufacturer's operations.

B. Provide to laboratory, preliminary representative samples of materials to be tested, in required quantities.

C. Furnish copies of mill test reports.

D. Furnish labor and equipment:

E. To provide access to the work to be tested.

F. To obtain and handle samples at the site.

G. To facilitate inspections and tests.

H. For laboratory's exclusive use for storage and curing of test samples.

I. Notify the Engineer and Owner at least 48 hours in advance of operations and subsequent testing to allowfor assignment of personnel to view testing.

J. Arrange with the laboratory and pay for additional samples and tests required for the Contractor'sconvenience.

PART 2 - PRODUCTS

2.1 EARTHWORK

A. Soil Analysis Tests (Site and Select Fill). One analysis required for each type of soil under pump buildingand fire lane paving for:

1. Liquid limit.
2. Plastic limit.
3. Plasticity index.
4. Maximum laboratory density (Proctor) tests.

A. Field density tests under pump building and fire lane paving for subgrade and each lift of fill: one for each 2500 square feet.

B. Additional Testing may be necessary as indicated in Section 01 40 00 Special Inspections.

2.2 PAVING - BASE COURSE

Test density (ASTM D 1557) and installed thickness in locations as directed by Engineer.

2.3 CONCRETE

Conform to ACI 301, as modified below.

B. Mix Designs. One for each class of concrete required, Method 1, Section 3.8.2, ACI 301.

C. Concrete Pours. Random sampling as directed by Engineer or Field representative to verify general compliance with contract documents. Each sampling: three cylinders and slump test (ASTM C 143). Testone at 7 days; two at 28 days.

2.4 STEEL

Observation and testing of shop welds and bolted work and nondestructive tests of completed welds when directedby Engineer.

2.5 MECHANICAL PIPING

Observation and testing of field welds and nondestructive testing of completed welds when

directed by the Engineer.

2.6 PROTECTIVE COATING PIPING

Holiday Testing of protective coating on the steel piping.

PART 3 - EXECUTION

3.2 Cooperate with the Engineer and Contractor; provide qualified personnel promptly on notice.

3.3 Perform specified inspections, sampling and testing of materials and methods of construction:

A. Comply with specified standards; ASTM or other recognized authorities, and as specified.

B. Ascertain compliance with requirements of the contract documents.

3.4 Promptly notify the Engineer and Contractor of irregularities or deficiencies of work which are observed duringperformance of services.

3.5 Prepare and distribute reports (PDF format) of all inspections and tests within 3 days of test completion or weekly on continuouswork as follows:

A. Engineer

B. Contractor

C. Owner

D. SAWS

3.6 Include the following information for each test as well as additional data specified in the applicable section.

A. Date of test.

B. Location of test.

C. Specified standards.

D. Test results.

E. Remarks.

3.7 The laboratory is not authorized to stop the work or:

A. Release, revoke, alter, or enlarge on requirements of the contract documents.

B. Approve or accept any portion of the work.

C. Perform any duties of the Contractor.

END OF SECTION

SECTION 01 5000

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. Email: Account/addresses reserved for Contractor's key personnel, including subcontractors project use.
3. Facsimile Service: Fax-to-email software on personal computer.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities are not permitted.

C. Maintain daily in clean and sanitary condition.

D. 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 and for public access to existing building.

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 prior to installation of security fencing.

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. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site.

D. 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.

E. 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. 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 Date of Substantial Completion inspection.

B. Remove temporary underground installations to a minimum depth of 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

SECTION 01 5100

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 TELEPHONE SERVICE

A. Provide list of all cellular and office phone numbers for key personnel of Contractor and subcontractors on the project. Provide detailed list to Engineer at Pre-Construction Conference.

B. If temporary land-line telephone service is provided, Contractor shall [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. Contractor shall secure a temporary water meter permit from the San Antonio Water System for use on this project.

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

SECTION 01 5500

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 on-site 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 and Engineer having jurisdiction, establish public and private thoroughfares to be used for haul routes and site access.

B. Contractor to prepare detailed video records of all access routes on public roads and rights-of-way prior to mobilization to the project site. Video records shall be dated, with appropriate voice records. Provide supporting photographs, dated, to reflect pre-existing conditions of all public and private roads.

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, trash, debris 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

SECTION 01 5713

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 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

B. Section 31 2200 - Grading.

C. Section 31 2316 - Excavation.

D. Section 31 2323 - Fill.

E. Section 31 3700 - Riprap.

1.03 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.

1.04 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: 30 feet, minimum, or full width of driveway, whichever is greater.
2. Length: 50 feet, minimum, as noted on the drawings.
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 3inches 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

SECTION 01 5713.10

SPILL RESPONSE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Guideline for Contractors for handing 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, Inc. (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, is so desired by Engineer.

END OF SECTION

SECTION 01 5813

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 with phone number.
4. Telephone numbers for Owner, Engineer and Contractor.

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

SECTION 01 7000

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 6000 - Product Requirements.

E. Section 01 7419 - Construction Waste Management and Disposal.

F. Section 01 7800 - Closeout Submittals.

G. Section 02 4100.10 - Site Demolition.

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 mis-fabrication.

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

SECTION 01 7123.10

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

SECTION 01 7800

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 one (1) electronic copy (PDF format) of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one electronic 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 electronic 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 printed and bound sets of revised final documents in final form within 10 days after final inspection. Provide one complete electronic copy of all final documents.

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 and/or Engineer.

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

SECTION 01 7836.10

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

SECTION 02 3000

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

SECTION 02 4100.10
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 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

SECTION 03 0100
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

SECTION 03 1000

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

SECTION 03 2000

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

SECTION 03 3000

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 irons 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 concert 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

SECTION 03 3000.10

CONTROLLED LOW STRENGTH BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor shall furnish all labor, materials, equipment and incidentals as shown, specified and required to provide for the proportioning, mixing, transportation and placement of Controlled Low Strength Backfill at the specified locations and dimensions shown on the plans, or as directed by the Engineer.

B. The Controlled Low Strength Backfill shall be composed of Portland cement, fly ash, natural fine aggregate and water, proportioned and mixed as herein specified.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 – Grading.

B. Section 31 2316 – Excavation.

C. Section 31 2316.13 – Trenching.

D. Section 31 2316.14 – Trench Excavation Protection.

E. Section 31 2323 - Fill.

1.03 QUALITY CONTROL

A. Testing

1. Test materials for compliance with technical requirements of the Specifications shall be performed by a testing laboratory.
2. Testing Services Include:
    a. Test the Contractor's proposed materials in the laboratory and/or field for compliance with the Specifications.
    b. Report test results to the Engineer and the Contractor.

1.04 PRICE AND PAYMENT PROCEDURES

A. Cement: By the cubic yard.

1.05 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendation of the following, except as otherwise shown or specified.

1. ASTM C 150, Portland Cement.
2. ASTM C 618, Fly Ash.
3. ASTM C 494, Water Reducing Admixtures.

1.06 SUBMITTALS

A. Certificates: Submit certificates of compliance with referenced standards.

B. The testing laboratory shall submit copies of the reports directly to the Engineer, with copy to the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Furnish hydraulic cement that meets the requirements of TxDOT's DMS-4600, "Hydraulic Cement," TxDOT's Hydraulic Cement Quality Monitoring Program (HCQMP), and

ASTM C-150 Type I Portland Cement. Sources not on the HCQMP or other sources to be used in combination with an approved source will require approval before use.

B. Fly Ash: Furnish fly ash conforming to TxDOT DMS-4610, "Fly Ash".

C. Chemical Admixtures: Furnish chemical admixtures conforming to TxDOT DMS-4640, "Chemical Admixtures for Concrete."

D. Fine Aggregate: Provide fine aggregate that will stay in suspension in the mortar to the extent required for proper flow and that meets the gradation requirements of Table 1. Test fine aggregate gradation in accordance with TxDOT standard laboratory test procedure Tex-401-A. Plasticity Index (PI) must not exceed 6 when tested in accordance with TxDOT standard laboratory test procedure Tex-l06-A.

TABLE 1 - GRADATION FOR FINE AGGREGATE

SIEVE SIZE	PERCENT BY WEIGHT PASSING SIEVES
3/8 inch	100
No. 8	80-100
No. 16	60-100
No. 30	45-80
No. 50	12-40
No. 100	1.5-25
No. 200	0-5

E. Admixtures
1. The use of any material added to the Controlled Low Strength Backfill shall be reviewed by the Engineer.
2. Water-reducing, set-controlling admixtures shall meet the requirements of ASTM C494, Type A, water-reducing, or Type D, water reducing and retarding. Water reducing admixtures shall be added to the mixer in accordance with manufacturer's printed instructions.

F. Water
1. Water used in mixing shall be as clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product as possible.
2. Water will be tested and shall meet the suggested requirements of AASHTO T26.
3. Water known to be of potable quality may be used without testing.

PART 3 EXECUTIONS

3.01 MIXING AND PROPORTIONING

A. The Contractor or Controlled Low Strength Backfill supplier shall submit for acceptance test data from prior experience if available.

B. The supplier also must provide 5 copies of the recommended mix proportions and trial batch test results prepared by an independent testing laboratory three weeks prior to use.

C. Submitted data should include product performance curves indicating 1, 7 and 28 day unconfined compressive strengths.

D. Proportions must be selected to produce the specified unconfined compressive strength and workability designed below.

E. Proportions shall be selected on the basis of unconfined compressive strength tests of specimens continuously moist cured, for testing at the age or ages specified below.

3.02 PERFORMANCE

A. Strengths: for trench backfill, the Controlled Low Strength Backfill shall have an unconfined compressive strength of 21 psi minimum, no more than 24 hours after watering. The 28 day unconfined compressive strength shall not exceed 500 psi.

B. Workability: The Controlled Low Strength Backfill shall be flowable and shall have an initial slump greater than 9" and a minimum slump of 4-½" after one hour.

C. When a sample of Controlled Low Strength Backfill is poured out on the ground, the aggregate and mortar should stay well mixed with no separation. The Engineer may reject the mix if excessive separation is found.

3.03 PLACING

A. For pipe trench backfill, provide bulkheads at units of fill placement sufficient to confine backfill to area designated in the plans. Bulkheads may be structural or earthen.

B. During placement, station workers in a safe location where they can view inside of pipe to check for leakage. When any leakage into pipe is discovered, stop placement and repair leak before resuming placement.

3.04 TESTING

A. A minimum of three test cylinders per 1000 cubic yards of Controlled Low Strength Backfill shall be drawn and tested for 7 and 28 day unconfined compressive strengths by the independent testing laboratory engaged by the Owner.

3.05 COVERING

A. Controlled Low Strength Backfill placed in pipe trenches may be covered when it adequately supports the weight of construction equipment, no less than 24 hours after completion of placement.

B. Other Controlled Low Strength Backfill should be allowed to cure for a minimum of 72 hours before covering.

END OF SECTION

SECTION 04 0511

MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 REFERENCE STANDARDS

A. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2010.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2011b.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

N. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.

O. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013.

P. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry; 1995 (Reapproved 2013).

Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.

R. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2010.

S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

T. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

U. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.03 SUBMITTALS

A. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

B. Samples: Submit two samples of mortar, illustrating mortar color and color range.

C. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

D. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. Mortar Mix Designs: ASTM C270, Property Specification.

2.02 MATERIALS

A. Masonry Cement: ASTM C 91, types as scheduled in this section.
   1. Colored mortar: Premixed cement.

B. Portland Cement: ASTM C 150, Type I - Normal.

C. Packaged Dry Mortar: ASTM C 387/C 387M.

D. Hydrated Lime: ASTM C 207

E. Quicklime: ASTM C5, non-hydraulic type.

F. Mortar Aggregate: ASTM C144.

G. Grout Aggregate: ASTM C404.

H. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As indicated on drawings.

I. Water: Clean and potable.

J. Accelerating Admixture: Nonchloride type for use in cold weather.

K. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

L. Bonding Agent: Latex or epoxy type.

2.03 MORTAR MIXES

A. Ready Mixed Mortar: ASTM C 1142.

B. Stain Resistant Pointing Mortar: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.

C. Colored Mortar: Proportion selected pigments and other ingredients without exceeding manufacturer's recommended pigment-to-cement ratio.

2.04 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

2.05 GROUT MIXES

A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M, or mix in accordance with ASTM C 476.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

B. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M, or mix in accordance with ASTM C 476.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.06 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick or block masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 3 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.

B. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
   1. Do not use high-lift grouting where size of cavities mandates use of fine grout.

C. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 12 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

D. High-Lift Grouting:
   1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
   2. Brick: Limit pours to maximum 16 feet in height and 25 feet horizontally.
   3. Hollow Masonry: Limit lifts to maximum 4 feet and pours to maximum height of 24 feet.
   4. Place grout for spanning elements in single, continuous pour.

3.04 FIELD QUALITY CONTROL

A. Test and evaluate mortar in accordance with ASTM C780 procedures.
   1. Test with same frequency as specified for masonry units.

B. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test with same frequency as specified for masonry units.

C. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518/E518M; perform tests and evaluate results as specified in individual masonry sections.

3.05 SCHEDULES

A. Exterior Cavity Wall: Type S mortar with Type N pointing mortar.

B. Loading Dock Area, No. 100: CMU partitions with Type N mortar.

C. Conference Room 102: Glass Unit Masonry with Type N mortar and Type O pointing mortar.

END OF SECTION

SECTION 31 1000

SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

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

1.05 QUALITY ASSURANCE

A. Clearing Firm: Company specializing in the type of work required.

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 -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

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 EXISTING UTILITIES AND BUILT ELEMENTS

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 not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, landscape areas, and planting beds.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the 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 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 1000.10
TREE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protection of Existing Trees.

1.02 RELATED REQUIREMENTS

A. Section 02 4100.10 - Site 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

SECTION 31 2200

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site.

C. 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. 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.

B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work 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 from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all 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, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

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. Remove topsoil from areas to be further excavated, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 2323 for filling procedures.

G. Benching Slopes: Horizontally bench slopes greater than 4:1 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 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.

3.05 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.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 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.

3.08 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316
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.

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

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark 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.

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, identify, and protect utilities that 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 EXCAVATING

A. Excavate to accommodate construction operations and to lines and grades indicated on the drawings.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Excavate to provide adequate work space and clearance for concrete forms. Do not undercut excavation face for extended footings.

D. Steep slope and trench excavations shall conform with OHSA standards for shoring and safety protection.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Cut utility trenches wide enough to allow inspection of installed utilities. Reference Sections 31 2316.13 and .

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

H. 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.

I. Stockpile excavated material to be re-used in area designated on site.

J. 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.

K. 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 for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.05 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade 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

SECTION 31 2316.13

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. 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. 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.

B. General Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

C. Structural Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Granular Fill:
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

E. 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. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

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.
   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: 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.

B. 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.

C. Concrete for Fill: As specified in Section 03 3000.10 - Controlled Low Strength Backfill.

D. 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.

E. 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. 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. Identify required lines, levels, contours, and datum locations.

3.02 PREPARATION

A. Locate, identify, and protect utilities that remain 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. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. 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.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow proper installation, jointing, embedment, and inspection of utilities. See drawing details for minimum trench width.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. 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.

H. 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.

I. 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.

J. Remove excavated material that is unsuitable for re-use from site.

K. 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.

L. Remove excess excavated material from site.

M. 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.

N. 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. Restore the surface of the backfilled trench, if not disturbed by surrounding construction, to match previous existing conditions.

G. 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 re-compaction 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. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 2316.14

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

SECTION 31 2323

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. 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 - 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, damp-proofing, 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 re-compaction 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

SECTION 31 3213.16
CEMENT SOIL STABILIZATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating, treatment, and placement of soil cement 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: By the cubic yard of soil cement, based on the cement/soil mix ratio. Includes supplying ingredient materials, scarifying substrate surface, mixing and placing where required, placing geotextile fabric, compacting and curing.

1.04 REFERENCE STANDARDS

A. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

B. ASTM D558 - Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures; 2011.

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

D. ASTM D1633 - Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders; 2000 (reapproved 2007).

E. Project Geotechnical Report.

1.05 SUBMITTALS

A. Submit mix design and materials mix ratio that will achieve specified requirements.

B. Test reports on compressive strength of mix.

C. 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 Texas Department of Transportation standards. 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. Cement: ASTM C150/C150M, Portland cement, Type I, Normal.

2.02 EQUIPMENT

A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting material.

2.03 SOIL CEMENT MIX

A. Mix materials in accordance with Texas Department of Transportation standard.

B. Mix to obtain a minimum compressive strength of 450 psi at 7 days.
   1. Test mix for compressive strength in accordance with ASTM D1633.

C. Add water to the mix to achieve a homogeneous damp mixture without lumping, yet not creating a wet plastic consistency.

D. Obtain approval of the mix before proceeding with placement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not backfill over frozen, wet, or soft subgrade surfaces.

3.02 EXCAVATION

A. Protect adjacent structures from damage by this work.

B. Excavate subsoil to depth sufficient to accommodate soil stabilization.

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. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

F. Notify Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume work.

G. Correct areas over-excavated in accordance with Section 31 2316.

H. Remove excess excavated material from site.

3.03 SOIL TREATMENT AND BACKFILLING

A. If required, place geotextile fabric over subsoil surface, lap edges and ends.

B. Site mix subsoil, backfill and compact. Blend treated subsoil mix to achieve mix formulation and required stabilization.

C. Place mix material in continuous layers not exceeding 8 inches depth.

D. Maintain optimum moisture content of mix materials to attain required stabilization. If more than one layer, maintain lower layer at optimum moisture until next layer is placed.

E. Place mixed materials within 2.5 hours of adding water to mix.

F. Do not exceed 30 minutes in placing adjacent mixed material.

G. Commence compaction of mix no later than 60 minutes after placement.

H. Compact mix to minimum of 95 percent of maximum density determined in accordance with ASTM D558; test in-place density in accordance with ASTM D1556.

I. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.

J. Shape to required line, grade, and cross section.

K. Make grade changes gradual. Blend slopes into level areas.

L. At end of day, terminate completed Work by forming a straight and vertical construction joint.

M. Replace damaged fill with new mix to full depth of original mix.

N. Remove surplus mix materials from site.

3.04 TOLERANCES

A. Top Surface of Fill: Plus or minus one inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Compression test and analysis of hardened fill material will be performed in accordance with ASTM D1633.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

C. Frequency of Tests: As directed by the Geotechnical Engineer.

END OF SECTION

SECTION 31 3700

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 MATERIALS

A. Riprap: Provide in accordance with State of Texas Highways 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. Do not place riprap over frozen, wet or soft subgrade surfaces.

3.02 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.

3.03 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

SECTION 32 1123
AGGREGATE BASE COURSES

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: City of San Antonio (COSA) Item 200 - By the cubic yard. Includes supplying aggregate material, stockpiling, scarifying substrate surface, placing, and compacting.

B. Fine Aggregate: City of San Antonio (COSA) Item 200 - 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 2024 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

SECTION 32 1313.10

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

SECTION 32 1731

STEEL GUARDRAIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel guardrail and steel or steel posts.

B. Excavating for post bases.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. Guardrail:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Includes rail, accessories, end closures, finished.

B. Intermediate Posts:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes excavating, sleeving through concrete, posts, backfilling and compacting at posts.

C. Terminal Anchor Posts:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes excavating, sleeving through concrete, posts, anchors and anchor footings, backfilling and compacting at posts.

1.04 REFERENCE STANDARDS

A. AASHTO M 180 - Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail; 2012.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A428/A428M - Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles; 2010 (Reapproved 2014).

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

H. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

I. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.

1.05 SUBMITTALS

A. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, anchorage, and schedule of components.

B. Product Data: Provide data on rail, posts, accessories, hardware and structural capabilities of rail section.

C. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates.

PART 2 PRODUCTS

2.01 MATERIALS

A. Guardrail Beam: AASHTO M 180 Class A or B Type II; W profile; rolled steel sections, die punched bolt holes for site assembly and attachment to posts, formed steel curved or tapered terminating sections.

B. Steel Posts: ASTM A501/A501M hot-formed tubing.

C. Wood Posts: Softwood timber, pressure preservative treated to AWPA U1 using water borne preservatives, 7 inch diameter nominal size.

2.02 ACCESSORIES

A. Concrete: ASTM C 94/C 94M, ready-mixed; Normal Portland Cement, 2,500 psi strength at 28 days, 3 inch slump; 1/2 inch nominal sized coarse aggregate.

B. Hardware: Steel, bolts, nuts and washers to suit rail profile.

2.03 FINISHES

A. Components: Galvanized in accordance with ASTM A123/A123M.

B. Components: Aluminum coated at 3.6 oz/sq ft, when measured in accordance with ASTM A428/A428M.

C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install rails and posts and accessories in accordance with manufacturer's instructions.

B. Set top of rail 28 inches above finish grade or as indicated on drawings.

C. Space posts at intervals not exceeding 6 feet, 3 inches.

D. Posts shall not be set in concrete unless otherwise indicated on drawings.

E. Posts to be located as indicated on drawings.

F. Attach rails securely to posts with anchoring hardware.

G. Attach terminal connectors, where required, meeting the material and galvanization requirements within this section.

3.02 TOLERANCES

A. Posts - Maximum Variation From Plumb: 1/2 inch.

B. Rail - Maximum Offset From True Position: 1/2 inch.

C. Rail - Maximum Variation From True Height: 1/2 inch.

D. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 32 3113

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Barbed wire.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

B. Gates: Measurement and payment by the unit. Includes frame posts, fabric, accessories, hardware.

1.04 REFERENCE STANDARDS

A. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire; 2013.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2017).

E. ASTM A428/A428M - Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles; 2010 (Reapproved 2014).

F. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; 2011 (Reapproved 2017).

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

J. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2014a.

K. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric; 2017.

L. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2017a.

M. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2016.

N. ASTM F1665 - Standard Specification for Poly(Vinyl Chloride)(PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence; 2008 (Reapproved 2013).

O. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

P. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.05 SUBMITTALS

A. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

C. Samples: Submit one sample of fence fabric, slat infill, 12 inch by 12 inch in size illustrating construction and colored finish.

D. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates.

E. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines _____.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.

PART 2 PRODUCTS

2.01 COMPONENTS – STANDARD SECURITY FENCING

A. Refer to SAWS Standard Specifications Item 845 Gate, Fencing and Property Marker Details.

B. https://apps.saws.org/business_center/specs/constspecs/docs/conspecs_2021

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate, terminal, and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: 2 feet.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 2 feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail _____. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 2 days.

J. Stretch fabric between terminal posts or at intervals of 50 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped outward and attach barbed wire; tension and secure.

P. Do not attach the hinged side of gate to building wall; provide gate posts.

Q. Install hardware and gate with fabric _____ to match fence.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Ground fence in accordance with State and local standards.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1/2 inch.

C. Do not infringe on adjacent property lines.

END OF SECTION

SECTION 32 3223

SEGMENTAL RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Segmental retaining walls made of modular concrete units with or without soil reinforcement.

B. Engineering design criteria for Contractor design submittals for segmental retaining walls.

1.02 PRICE AND PAYMENT PROCEDURES

A. Excavation of unsuitable soil and replacement with acceptable fill beneath the wall footing will be as per the geotechnical recommendations and will be paid by lump sum.

B. Segmental retaining walls inclusive of leveling pad and structural fill will be paid by lump sum

1.03 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

B. Section 31 2200 - Grading.

C. Section 31 2316 - Excavation.

D. Section 31 2323 - Fill.

1.04 REFERENCE STANDARDS – AS RECOMMENDED BY WALL DESIGN ENGINEER.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section with the Wall Design Engineer, material supplier, installer, and the Engineer.

1.06 SUBMITTALS

A. Segmental Retaining Wall Units shall be provided as a complete submittal by the Contractor.

B. Shop Drawings: All Engineering drawings for installation, including elevations, large-scale details of elevations, typical sections, details, and connections, soil reinforcement, and drainage provisions shall be provided by a Wall Design Engineer.

1. Include contract drawings showing exact dimensions for blocks, required coping, and other minor revisions. Color and finish of blocks should be submitted to the engineer for owner approval.
2. Design Data: **Submit detailed design calculations showing compliance with specified design criteria and material evaluations performed in accordance with specified design standard, signed and sealed by a licensed Engineer of the State of Texas.**
3. Submit no less than 3 weeks prior to start of work.
4. Contractor to secure all appropriate and applicable local City and County permits for construction of retaining wall.
5. Obtain approval of Engineer prior to start of work.

1.07 QUALITY ASSURANCE

A. **Design Engineer Qualifications: Provide retaining wall design by or under direct supervision of Professional Engineer of the State of Texas experienced in the work of this section.**

PART 2 PRODUCTS

2.01 MANUFACTURERS – AS RECOMMENDED BY THE WALL DESIGN ENGINEER

2.02 RETAINING WALLS

A. Contractor is responsible for design of the retaining walls

2.03 MATERIALS – AS RECOMMENDED BY WALL DESIGN ENGINEER.

PART 3 EXECUTION – AS RECOMMENDED BY THE WALL DESIGN ENGINEER.

END OF SECTION

SECTION 32 9219

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

SECTION 32 9223

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: Topsoil placement and finish grading.

1.03 PRICE AND PAYMENT PROCEDURES

A. Topsoil:
   1. Basis of Measurement: By the square 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; Contractor will pay for water through acceptance of the project.

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

SECTION 33 0273

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.

C. Section 33 0561 - Concrete Manholes

D. Section 33 3113 - Site Sanitary Sewerage Gravity Piping.

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

SECTION 33 4100

SUBDRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.

B. Filter aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

A. Section 31 2316 - Excavation.

B. Section 31 2316.13 - Trenching.

C. Section 31 2316.14 - Trench Excavation Protection.

D. Section 31 2323 - Fill.

1.03 PRICE AND PAYMENT PROCEDURES

A. Pipe and Fittings: By linear feet. Includes hand trimming excavating, bedding, pipe and fittings, filter aggregate, filter fabric connecting to municipal sewer.

1.04 REFERENCE STANDARDS

A. ASTM C4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; 2004 (Reapproved 2014).

B. ASTM C412 - Standard Specification for Concrete Drain Tile; 2015.

C. ASTM C412M - Standard Specification for Concrete Drain Tile (Metric); 2015.

D. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.05 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections.

B. Product Data: Provide data on pipe drainage products, pipe accessories, filter fabric and gravel bedding material.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride Pipe: ASTM D 2729; tapered pipe end and coupling joints, 4 inch inside diameter; with required fittings unless otherwise indicated on drawings.

B. Bituminous Fiber Pipe: With Type tapered pipe end and coupling joints; 4 inch inside diameter; with necessary fittings unless otherwise indicated on drawings.

C. Corrugated Plastic Tubing: Flexible type; 4 inch diameter, with required fittings unless otherwise indicated on drawings.

D. Use perforated pipe along horizontal subdrainage system; unperforated through sleeved walls or vertical subdrainage system.

2.02 AGGREGATE AND BEDDING

A. Filter Aggregate and Bedding Material: Granular fill or gravel as specified in Section 31 2323.

B. Filter Sand and Bedding Material: Sand as specified in Section 31 2323.

2.03 ACCESSORIES

A. Pipe Couplings: Solid plastic.

B. Filter Fabric: Water pervious, black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut or excavated base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with Type A1 aggregate.

B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage pipe on gravel bedding material.

C. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Place pipe with perforations facing down. Mechanically join pipe ends.

E. Install pipe couplings.

F. Install filter aggregate at sides and top of pipe. Provide top cover compacted thickness of 12 inches minimum or as indicated on drawings.

G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.

H. Place aggregate in maximum 8 inch lifts, compacting each lift.

I. Refer to Section 31 2323 for compaction requirements. Do not displace or damage pipe when compacting.

J. Place impervious fill over drainage pipe aggregate cover and compact.

K. Connect to storm drain system with unperforated pipe .

L. Coordinate the Work with connection to storm drain system, and trenching.

3.04 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Field inspection and testing.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

SECTION 33 4211

STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stormwater drainage piping.

B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

C. Section 31 2316.13 - Trenching.

D. Section 31 2316.14 - Trench Excavation Protection.

E. Section 31 2323 - Fill.

F. Section 33 0561 - Concrete Manholes.

G. Section 33 4213 - Pipe Culverts.

1.03 PRICE AND PAYMENT PROCEDURES

A. Pipe and Fittings:

1. Basis of Measurement: By the linear foot.
2. Basis of Payment: Includes hand trimming excavation, bedding and backfilling, pipe and fittings, connection to building service piping and to municipal system.

B. Catch Basins and Cleanouts:

1. Basis of Measurement: By the unit.

1.04 REFERENCE STANDARDS

A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.

B. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.

C. ASTM D 667 - Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

D. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

E. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.

F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

G. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

H. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

I. ASTM F 2648 - Standard Specification for 2 to 60-inch Annular Corrugated Profile Wall Polyethylene Pipe and Fittings.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of storm drains with local authority having jurisdiction for permits and inspections with regard to size, material, location and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers and local inspection authorities.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. Product Data: Provide data indicating pipe and pipe accessories .

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

C. Manufacturer's Certificate: Certify that materials meet or exceed specified requirements.

D. Project Record Documents:
   1. Record location of pipe runs, connections, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 STORM SEWER PIPE MATERIALS

A. Cast Iron Soil Pipe: ASTM A 74, Extra Heavy grade, hub and spigot end.

B. Concrete Pipe Joint Devices: ASTM C443 (ASTM C443M) rubber compression gasket joint.

C. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class II with Wall type A; mesh reinforcement; bell and spigot end joints.

D. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

E. Plastic Pipe: ASTM D 2751, SDR 35, Acrylonitrile-Butadiene-Styrene (ABS) material; bell and spigot style solvent sealed joint end.

F. Plastic Pipe: ASTM D 2729, Poly(Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.

G. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.

H. Plastic Pipe: ASTM D 1785, Schedule 40, Poly(Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.

I. Corrugated Steel Pipe: AASHTO M 36M Type I; helical lock seam; coated inside and out with 0.050 inch thick bituminous coating.

J. Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches (250 mm) wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

K. ADS N-12 WT 1B Pipe: ASTM F 2648; 4 inches to 60 inches High Density Polyethylene; bell and spigot ends with a gasket seal.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Filter Fabric: Non-biodegradable, woven.

2.03 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Lids and Drain Covers: Cast iron.
   1. Catch Basin:
      a. H-20 loaded.
      b. Nominal Lid and Frame Size: As shown on drawings.
   2. Cleanout:
      a. Lid Design: As shown on drawings.
      b. H-20 loaded.
      c. Nominal Lid and Frame Size: As shown on drawings.
   3. Area Drain:
      a. Lid Design: As shown on drawings.
      b. H-20 loaded.
      c. Nominal Lid and Frame Size: As shown on drawings.

B. Trench Drain System: Trench drain system assembled from factory fabricated, concrete castings in standard lengths; with or without built in slope; with integral joints and optional grating support rails; includes grating.
   1. Grating Material and Style: Slotted cast iron.
   2. Trench Width: As shown on the drawings.
   3. Trench Section Length: As shown on the drawings.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

A. Verify that trench cut or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building storm drainage system, foundation drainage system, and utility/municipal system.

E. Make connections through walls through sleeved openings, where provided.

3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

A. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

3.04 FIELD QUALITY CONTROL

A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4213

STORMWATER CULVERTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of pipe culvert, joints and accessories.

B. Bedding and slope protection at pipe end.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2316 - Excavation.

C. Section 31 2316.13 - Trenching.

D. Section 31 2316.14 - Trench Excavation Protection

E. Section 31 2323 - Fill.

F. Section 31 3700 - Riprap.

G. Section 33 4111 - Site Storm Utility Drainage Piping.

1.03 PRICE AND PAYMENT PROCEDURES

A. Pipe Culvert: By the total linear foot invert length of pipe including tapered ends and the diameter in inches. Includes excavating; removing soft subsoil, bedding fill, compacting; pipe, catch basins, junction boxes, fittings and accessories assembled; repair of damaged coating and connection to existing pipe culverts.

1.04 REFERENCE STANDARDS

A. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe; 2001 (Reapproved 2013).

B. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2015.

C. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric); 2015.

D. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.

E. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

F. ASTM F 2698 - Standard Specification for 2 to 60-inch Annular Corrugated Profile Wall Polyethylene Pipe and Fittings for Land Drainage Applications.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle all pipe, fittings and accessories carefully with handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid pipe. Chains or cables will not be allowed to load or unload pipe. Materials cracked, gouged, chipped, dented or otherwise damaged will not be allowed for use on the project.

B. Store pipe and fittings on heavy wood blocking or platforms so they are not in contact with the ground.

C. Pipe, fittings and specials shall be loaded opposite to or as close to the place where it is to be laid as is practical to avoid unnecessary handling. Interior shall be kept completely free from dirt and foreign matter.

D. Obtain each type of pipe and fittings from a single manufacturer.

1.07 SUBMITTALS

A. Product Data: Provide data on pipe, fittings and accessories.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

C. Accurately record actual locations of pipe runs, connections, and invert elevations.

D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable or municipal code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.01 CULVERT PIPE

A. Pipe

1. Pipe for culverts shall be of the following types, manufactured in accordance with the requirements of the specifications for each type:
    a. Corrugated Steel Pipe: Fabricated of ASTM A 929/A 929M galvanized steel sheet:
        1) Helical lock seam.
        2) Coated inside and out with 0.050 inch thick bituminous coating.
        3) Shape: Circular.
        4) Tapered Ends: Same material as pipe, machine cut, for joining to pipe end.
        5) Coupling Bands: Galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.
    b. Reinforced Concrete Culvert Pipe: Reinforced concrete culvert pipe shall conform to all requirements of ASTM Standard Specification C-76. The minimum "D-Load" for design of the pipe under Specification C-655, or the selection of pipe class under Specification C-76.
    c. Polyvinyl Chloride Pipe: Polyvinyl chloride pipe and fittings PVC 1120, conforming to ASTM D1785-76.
    d. PVC Pipe and Fittings: Standard and perforated PVC pipe and fittings conforming to ASTM D2729 sewer piping or D2665 DWV piping.
    e. Ductile Iron Pipe and Fittings: Ductile iron pipe and fittings shall conform to all requirements of AWWA C 151 and C 111 and shall be equivalent to a class 150 pipe.
    f. High Density Polyethylene Pipe (HDPE): High Density Polyethylene double wall pipe and fittings conforming to all requirements of ASTM F 2698; ADS N-12 or equivalent.

B. Joints

1. Reinforced Concrete Pipe Jointing Materials: Jointing material shall be either a plastic type joint or cement grouted joint. Where cement grouted joints are specified, the

Contractor may, at his expense, substitute plastic type joints after review by the Engineer.

a. Rubber Gasket Joints: Where rubber gasket pipe joints are required, the joint assembly shall be made according to the recommendations of the gasket manufacturer. Water tight joints will be required when using rubber gaskets.

b. Plastic Joints: Plastic joints for reinforced concrete culvert pipe of all kinds shall meet the requirements covered in either Paragraph (13)(b) or Paragraph (13)(d), Section 464.2, of Item 464, "Reinforced Concrete Pipe Culverts", of the Texas Department of Transportation Standard Specifications.

c. Cement Mortar Grouted Joints: Pipe joints shall be made with Portland Cement Mortar. All joints of concrete pipe shall be filled with stiff mortar composed of one part Portland Cement and not more than two parts sand. The mortar shall be used within 30 minutes from the time that the ingredients are mixed with water.

d. Diaper Bands: Diaper bands shall be placed at every joint when the pipe is laid on a curve. Gauze or cloth fabric bands top hold grout in place at joints shall be made and used as follows:

1) The fabric bands shall be cut into such lengths that they will extend the full circumference of the pipe. The longitudinal edges of fabric bands shall be rolled and stitched around two (2) pieces of wire. The width of the fabric bands shall be such that after being filled with mortar, a band will be formed. The wires shall be cut into such lengths that they pass around the pipe with sufficient extra length for the ends to be twisted at the top of the pipe to hold the fabric securely in place, and shall be accurately centered around the joint.

2. PVC Joints: Materials and methods shall be in accordance with the manufacturer's recommendations.

2.02 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

2.03 ACCESSORIES

A. Filter Fabric: Non-biodegradable, woven.

B. Fill at Pipe Ends: Riprap as specified in Section 31 3700.

PART 3 EXECUTION

3.01 EXCAVATING

A. All excavation shall be in accordance with the requirements of Section 31 2316.13 and 31 2316.14 except where tunneling or jacking methods are shown on the plans or permitted by the Engineer. The Contractor shall make such temporary provision as may be necessary to insure adequate drainage of the trench and bedding during the construction operation.

3.02 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe and accessories in accordance with manufacturer's instructions

C. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

D. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

E. Repair surface damage to pipe protective coating with two coats of compatible bituminous paint coating.

F. Install culvert end gratings.

3.03 JOINTING

A. Reinforced Concrete Pipe

1. Application of the jointing material and construction methods recommended by the manufacturer shall be strictly adhered to.
2. Rubber Gasket Joints:
   a. Rubber gasket joints shall be made with materials specifically intended for the purpose intended and installed according to the manufacturer's recommendations.
3. Plastic Joints:
   a. Plastic joints shall be made with Cold Applied Plastic Asphalt Sewer Joint Compound of Cold Applied Preformed Plastic Gaskets meeting the requirements as set forth earlier in these sections.
4. Mortar Joints:
   a. All pipe shall be joined tight and sealed with stiff mortar, composed of one part Portland and not more than two parts sand, so placed as to form a durable water tight joint.
   b. The ends of the pipe shall be cleaned thoroughly and wetted before making the joint.
   c. After any section of pipe is laid an even layer of mortar shall be thoroughly troweled onto the lower half of the bell or groove of the last laid section.
   d. Mortar shall be applied to the upper portion of the tongue or spigot of the pipe section being laid. The spigot or tongue end of the next section of pipe shall then be inserted and the joint pulled up tight, taking care that the inner surfaces of the abutting pipe sections are flush and even.
   e. After the section is laid and uniformly matched and fitted as close as the construction of the pipe will permit, the lower half of the inner circumference of the joints shall be sealed and packed with mortar and finished smooth and even with the adjacent section of pipe.
   f. Before this mortar has attained initial set, additional mortar then shall be applied from the outside and forced into the unfilled portion of the bell or groove to fill completely the annular space around the spigot or tongue.
   g. For bell and spigot pipe, a bead shall be formed on the outside by troweling on mortar downward at an angle of 45 degrees from the outer edge of the bell to the spigot of the last laid section.
   h. For tongue and groove pipe, a bead shall be formed extending at least 1 inch on either side of the joint and of approximately semi-circular cross-section.
   i. After the initial set, the mortar on the outside shall be protected from air and sun with thoroughly wetted earth or burlap cover or acceptable equivalent, and shall be kept wet for a minimum of 48 hours or until the backfill has been completed. No jointing shall be done when the atmospheric temperature is at or below 40°F, and when necessary, because of a sudden drop in temperature, joints shall be protected against freezing for at least 24 hours.

5. Diaper Bands:
    a. After diaper bands have been secured in place, grout, composed of one (1) part Portland Cement and not more than two (2) parts sand, shall be poured between the gauze band and the pipe, to insure a thorough sealing of the joint.
    b. The completed joints shall immediately be protected from the air and sun with proper covering and shall be kept protected for such period as necessary to secure satisfactory curing of the mortar.
    c. The placing of this type joint shall be kept at least five joints behind the actual laying of the pipe.
    d. No backfilling around joints shall be done until the joints have cured for a minimum of 24 hours.

B. PVC Pipe
    1. PVC pipe less than six inches (6") in diameter shall be joined with PVC solvent cement conforming to ASTM D 2564, or manufacturer's recommendations.
    2. PVC pipe six inches (6") in diameter and larger shall be joined with gasket type connections in accordance with the manufacturer's recommendation.

C. HDPE Pipe
    1. Shall be joined with gasket type connections in accordance with manufacturer's recommendations.

3.04 PIPE ENDS

A. Place fill at pipe ends, at embankment slopes.

3.05 TOLERANCES

A. Lay pipe to alignment and slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

B. Maximum Variation From Intended Elevation of Culvert Invert: 1/4 inch.

C. Maximum Offset of Pipe From True Alignment: 1 inch.

D. Maximum Variation in Profile of Structure From Intended Position: 0.25 percent.

3.06 PROTECTION

A. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

3.07 BACKFILL

A. After the pipe has been placed, bedded, and jointed as specified filling and/or backfilling shall be done in accordance with the requirements of Section 31 2316.13 - Trenching.

END OF SECTION