BROWNSVILLE NAVIGATION DISTRICT

BID DOCUMENTS
AND
SPECIFICATIONS FOR

2023 OSTOS ROAD PAVEMENT REHABILITATION

NOVEMBER 28, 2022

PORT OF BROWNSVILLE

the port that *works*

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2023 OSTOS ROAD PAVEMENT REHABILITATION

Advertisement for Bids

2023 OSTOS ROAD PAVEMENT REHABILITATION

Notice to Bidders

Notice is hereby given that bids will be received by the Brownsville Navigation District ("BND") of Cameron County, Texas for the "**2023 OSTOS ROAD PAVEMENT REHABILITATION"** project at the Port of Brownsville, Cameron County, Texas.

Bids must be delivered in a sealed envelope labeled with the project name to BND at 1000 Foust Road, Brownsville, Texas 78521 no later than **2:00 P.M.** on **Monday, November 28, 2022**, addressed to Mr. Zeus Yañez, BND Finance Director. Bids will be calculated on a Unit Price basis and must comply with the requirements set out in the **Bid Document**, which may be obtained from Mr. Ariel Chávez II, PE/RPLS, Director of Engineering Services at achavez@portofbrownsville.com, at (956) 831-4592, or at www.portofbrownsville.com. Bid security in the amount of 5% of the highest bid amount is required as specified in the **Bid Document**. A **Mandatory** Pre-Bid Virtual Conference will be held at **2:00 P.M.** on **Thursday, November 10, 2022**. The link will be made available to interested bidders who submit the **Intent to Bid Form**, which could be retrieved from the Port of Brownsville website.

The BND Board of Commissioners **HEREBY RESERVES THE RIGHT** to reject any and all bids, and to select the bid deemed most advantageous to the BND.

10/31/2022, 11/07/2022

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. RECEIPT AND OPENING OF BIDS:

The Brownsville Navigation District, Texas, (hereinafter called OWNER), invites bids on the form attached hereto, all blanks of which must be appropriately filled in, in ink.

The OWNER may consider informal and non-responsive, any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No BIDDER may withdraw a bid within at least ninety (90) days after the actual date of the opening thereof.

2. INSPECTION OF SITE:

Each BIDDER shall visit the site of the proposed work and fully acquaint himself with the existing conditions there relating to construction and labor, and shall fully inform himself as to the facilities involved, the difficulties and restrictions attending the performance of the Contract. The BIDDER should thoroughly examine and familiarize himself with the Drawings, Technical Specifications, and all other Contract Documents. The Contractor, by the execution of the Contract, shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal instrument, or to visit the site and acquaint himself with the conditions there existing and the OWNER will be justified in rejecting any claim for extra time, or compensation, or both, based on facts regarding which Contractor should have been on notice as a result thereof.

3. PREPARATION OF BID AND USE BID FORMS:

These contract documents include a complete set of bidding documents. The BIDDER shall copy all documents listed in the table of contents under the heading BIDDING DOCUMENTS and shall submit his bid on these forms. A bid shall be comprised of the BIDDING DOCUMENTS completed by the BIDDER plus supplemental information required by the specifications and documents or deemed necessary by the BIDDER to fully describe his offering.

If any of the information submitted as part of the bid is considered to be proprietary by the BIDDER, he shall identify such in his bid.

a) Preparation. Each bid shall be carefully prepared using the proposal and proposal data forms included as a part of the bidding documents. Entries on the proposal and proposal data forms shall be typed, using dark black ribbon, or legibly written in black ink. All prices shall be stated in words and figures except where the forms provide for figures only. In case of discrepancy, the amount shown in words will govern.

   The BIDDER shall acknowledge, in the space provided in the proposal form, receipt of each addendum issued for the specifications and documents during the bidding period.

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

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

Proposals by partnerships shall be signed with the partnership name followed by the signature and designation of one of the partners or other authorized representative. A complete list of the partners shall be included with the proposal.

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

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

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

Submit the original proposal and one signed copy of the proposal to:

Chairman, Board of Commissioners
Brownsville Navigation District, Texas
c/o Ariel Chávez II, P.E./R.P.L.S.
1000 Foust Road
Brownsville, Texas 78521

Each bid must be submitted in a sealed envelope bearing on the outside the name of the BIDDER, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

4. METHOD OF BIDDING: UNIT PRICE.

Prices shall be firm, not subject to qualification, condition or adjustment. Prices shall be in United States dollars. Prices shall be lump sum except where unit prices are requested by the bid forms. If unit price items are required by the proposal, the unit prices for each of the several items in the proposal of each BIDDER shall include its pro-rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price bid represents

the total bid. Any bid not conforming to the requirement may be rejected as informal and non-responsive. The special attention of all BIDDERS is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation allowed, provided the net monetary value of all such additive and subtractive changes in quantities of such items of work pursuant to public competitive bidding statutes (i.e., difference in cost) shall not increase or decrease the original contract price by more than twenty-five (25%) percent. A proposed decrease only that exceeds twenty-five (25%) percent of the original contract price must be agreed to in advance by the Contractor.

5. DISCLOSURE BY BIDDER:

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

6. SUBCONTRACTS:

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

7. BID SECURITY:

Each bid must be accompanied by certified or cashier's check, or a bid bond prepared on the form of the bid bond attached hereto, duly executed by the BIDDER as principal and having as surety therein a surety company approved by the OWNER, authorized to do business in the State of Texas in the amount of not less than five (5%) percent of the bid. Such checks, or bid bonds will be returned to all except the three lowest BIDDERS within fifteen (15) days after the opening of bids, and the remaining checks, or bid bonds will be returned promptly after the OWNER and the accepted BIDDER have executed the contract or if no award has been made, within thirty (30) days after the date of the opening of bids. The bid security will be returned upon demand of the BIDDER at any time thereafter, so long as he has not been notified of the acceptance of his bid.

8. ADDENDA AND INTERPRETATIONS:

No oral interpretations by OWNER and its representatives shall be binding upon OWNER as to the meaning of the plans, specifications, contract documents, or other pre-bid documents.

Every request for such interpretation should be made in writing, addressed to the Engineering Services Department of the Brownsville Navigation District, and must be received at least ten (10)

days prior to the date fixed for the opening of bids in order to be considered. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be on file at the Department mentioned above no later than five (5) days prior to the date fixed for opening of bids, and will be mailed by certified mail with return receipt requested to all prospective BIDDERS (at the respective addresses furnished for such purposes), not later than three (3) days prior to said date. It will be the BIDDER's responsibility to inquire as to any addenda issued and failure of any BIDDER to receive any such addenda or interpretation shall not relieve such BIDDER from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

9. TELEGRAPHIC MODIFICATION:

Any BIDDER may modify his bid by telegraphic and/or telefax communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic or telefax communication is received by the OWNER prior to the closing time, and provided further, the OWNER is satisfied that a written confirmation of the telegraphic or telefax modification over the signature of the BIDDER was also mailed prior to the closing time. The telegraphic or telefax communication should not reveal the total bid price, but should provide the addition or subtraction, or other modification, so that the final prices or terms will not be known by the OWNER until the original sealed bid is opened.

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

If written confirmation is not received within two (2) days from the closing time, no consideration will be given to the telegraphic or telefax modification.

10. TIME FOR RECEIVING BIDS:

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

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

11. OPENING OF BIDS:

At the time and place fixed for the opening of bids, the OWNER will cause to be opened and publicly read aloud every bid received within the time set for receiving bids, irrespective of any irregularities therein. BIDDERS and other persons properly interested may be present, in person or by representative.

12. WITHDRAWAL OF BIDS:

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

13. AWARD OF CONTRACT: REJECTION OF BIDS:

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

The OWNER reserves the right to consider as not responsible any BIDDER who does not habitually perform with his own forces the major portions of the work involved in construction of the improvements embraced in this contract.

14. EXECUTION OF AGREEMENT: PERFORMANCE AND PAYMENT BOND:

Subsequent to the award and within ten (10) days after the prescribed forms are presented for signature, the successful BIDDER shall execute and deliver to the OWNER an agreement in the form included in the contract documents in such number of copies as the OWNER may require.

Having satisfied all conditions of award as set forth elsewhere in these documents, the successful BIDDER shall, within the period specified in the preceding paragraph, furnish a Performance Bond and Payment Bond, each in a penal sum not less than the full amount of the contract as awarded, as security for the faithful performance of the contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature including utility and transportation services, employed or used by him in performing the work. Such bonds shall be in the same form as that included in the contract documents and shall bear the same date as, or a date subsequent to that of the agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bonds. These bonds shall be signed by a guaranty or surety company legally authorized to do business in the State of Texas.

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

15. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT:

The successful BIDDER, upon his failure or refusal to execute and deliver the contract, bonds and insurance certificates required within ten (10) days after he has received notice of the acceptance of his bid, shall forfeit to the OWNER, as liquidated damages (and not as a penalty) for such failure or refusal, the security deposited with his bid.

16. TIME OF COMPLETION AND LIQUIDATED DAMAGES:

BIDDER must agree to commence work on or before a date to be specified in a written "Notice to Proceed" issued by the OWNER and to fully complete the project within the contract time, as provided in Article 3 of the Agreement.

BIDDER must agree also to pay as mutually agreed to liquidated damages, and not as a penalty, the sum of five hundred dollars ($500.00) per day for each consecutive calendar day thereafter, as provided in said Article 3.

17. NOTICE OF SPECIAL CONDITIONS:

Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

A. Inspection and testing of materials.
B. Insurance requirements.
C. Wage and Hour Provisions.
D. State Sales and Use Tax Exemption Provisions

18. LAWS AND REGULATIONS:

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

19. EQUAL EMPLOYMENT OPPORTUNITY:

Attention of BIDDERS is particularly called to the requirement for ensuring that employees and applicants for employment are not discriminated against because of their race, color, religion, sex, handicap, or national origin.

20. PRE-BID CONFERENCE:

A pre-bid meeting between the OWNER, prospective bidders, suppliers, etc., will be held to answer any questions concerning the work. No addenda will be issued at this meeting. Subsequent thereto, if necessary to clear up any written questions, a written addendum will be issued by the OWNER to all pre-bid conference attendees. The pre-bid meeting will be held at the place, time

and date indicated in the Invitation to Bid, unless re-scheduled by Addendum. Interested parties are invited to attend.

21. SUBMITTAL OF TRENCH SAFETY DESIGN:

If project includes open trench excavation deeper than 5 feet, contractor shall submit a trench safety system to Engineer for review and approval prior to beginning of construction.

22. INFORMATION TO BE SUBMITTED WITH PROPOSAL:

Each BIDDER shall submit with his proposal pertinent information concerning proposed equipment and materials and proposed construction organization.

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

   The proposal shall be based on new equipment and materials which comply with specifications and documents in every respect, unless the BIDDER takes specific exception as provided herein before. If alternate or "equal" equipment and materials are indicated in the proposal, it shall be understood that the OWNER will have the option of selecting any one of the alternates so indicated and such selection shall not be a cause for extra compensation or extension of time.

b) Contractor's Field Organization. Each BIDDER shall submit with his proposal an organization chart showing the names of field management, supervisory, and technical personnel, and the details of the management, supervisory, and technical organization which he proposes to use for this project. The successful BIDDER's organizational concept will be subject to the review and acceptance of the OWNER. The experience record of the Contractor's field superintendent shall be submitted with the proposal.

23. PREFERENCE LAW:

Proposal evaluation will take into consideration any Preference Laws of the Statutes of Texas.

24. SUBSURFACE CONDITIONS:

Each BIDDER shall be responsible for determining prior to bidding, the types of subsurface materials which will be found. If test borings have been made on the site, the locations and logs of the test borings are included in the plans.

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

All excavation for this project will be unclassified and the BIDDER shall be responsible for

investigating and satisfying himself of subsurface conditions (including the presence or likelihood of encountering rock or rock-like materials and debris) prior to submitting his bid, which shall include any and all costs BIDDER associates with avoiding, managing or removing said subsurface conditions without claim for extra compensation against OWNER.

25. DISPOSAL OF EXCESS MATERIALS:

After backfilling and compacting any temporary trenches backfill or removing temporary earthen material, there may be in some instances an excess of soil material over that required to bring the backfill up to the original grade. In such cases where there is an excess of material, BIDDER shall load and haul it away from the job site and dispose of it in a legal manner so as not to trespass, adversely impact any protected wetlands, adversely impact the 100 year flood plain, adversely impact any endangered species, or otherwise create drainage diversions or impoundments. No extra remuneration for this work will be allowed.

26. EROSION AND SEDIMENT CONTROL MEASURES:

The BIDDER is expected to conduct his work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the PLANS, to preclude erosion of the soil. Such operations should be timed consistent with the actual need for doing the work and only to leave raw, unprotected surfaces for a minimum of time.

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

As construction progresses, and in accordance with current federal legislation regulating storm water runoff and management from construction sites greater than five acres in size, if applicable, (See: Section 405 of the Water Quality Act of 1987, Section 402(P) as amended), and at locations where erosion with sediment runoff occurs or is likely to occur, the BIDDER shall construct temporary ditches, retainage levees, drains, inlets, or other works to correct the condition. Upon completion of the work, such facilities shall be removed.

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

27. SAFETY PROVISIONS:

BIDDER shall provide barricades, flares, warning signs, and/or flagmen so as to eliminate danger and inconvenience to the public, railroad and job site personnel. In addition to any other requirements of the Contract Documents, the BIDDER shall be responsible for familiarity and compliance with all Federal (OSHA), State, Railroad and local safety rules, laws and requirements with particular attention to be given to excavation and trench safety requirements.

28. PROTECTION OF PROPERTY AND EXISTING UTILITIES:

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

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

29. WAGES AND HOURS:

The most recent wage rate determination from the U.S. Department of Labor for Cameron County as locally adopted by the BND is a part of these specifications and controls minimum wage, hour and any fringe benefits.

A copy of the wage rate schedule must be posted at the job site in both English and Spanish and kept posted in a conspicuous place on the site of the project at all times during construction. The BIDDER shall familiarize himself with the included General Conditions Section entitled “Wage and Labor Standard Provisions - 100% Locally Funded Construction.” Copies of the wage rate schedule are included herein, but the responsibility for posting and keeping posted rests upon the BIDDER.

30. GUARANTEE:

The BIDDER shall guarantee the work for a period of one (1) year after date of acceptance in writing by the OWNER. During this period, the BIDDER shall make any repairs and/or replacements of defective materials and corrections due to poor workmanship, all as may be required for full compliance with the Specifications. This guarantee shall apply to all matters reported by the OWNER in writing within said one (1) year period and this guarantee shall be included in the coverage period set forth in the Performance Bond.

31. SECURITY GRANT CONTRACT PROVISIONS:

The successful BIDDER shall comply with the Security Grant Contract Provisions as outlined in the next section of these contract documents. In the event these Provisions differ from any other similar requirement in these documents, these provisions shall govern. The successful BIDDER shall, upon request by the OWNER or the OWNER’s representative, provide proof of compliance with each such provision, as applicable and as required.

Intent to Bid Statement

2023 OSTOS ROAD PAVEMENT REHABILITATION

November 28, 2022

1. **CONTRACTOR'S INFORMATION**:

Contractor: _____

Address: _____ Main Phone: _____

City: _____ State: _____ Zip: _____

2. **CONTRACTOR'S INTENT TO BID STATEMENT**:

We, the above-named contractor, hereby declare our Intent to Bid on the **"2023 OSTOS ROAD PAVEMENT REHABILITATION**" project at the Port of Brownsville.

We acknowledge and understand that a **Mandatory Pre-Bid Virtual Meeting** will be held at the BND Administration Building, 1000 Foust Road, Brownsville, TX and will attend virtually or in person. We assume responsibility to secure the link for said Virtual Meeting.

We hereby request to be included in the bidder's list and to be notified of the issuance of any Addenda for this project. We also acknowledge and understand that our company information on this form will be made available to the public.

3. **CONTRACTOR'S OFFICER**:

Name: _____ Work Phone: _____

Title: _____ Cel Phone: _____

Signature: _____ Date: _____

Main eMail Address: _____

Secondary eMail Address: _____

Bid Form

2023 OSTOS ROAD PAVEMENT REHABILITATION

Place: Board of Commissioners - Brownsville Navigation District
1000 Foust Road
Brownsville, Texas 78521

Due Date: Before **2:00 P.M. C.S.T.**, **Tuesday, November 28, 2022**.

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

To: The Brownsville Navigation District, Texas, hereinafter called OWNER.

Gentlemen:

The BIDDER, in compliance with your invitation for bids for the "**2023 OSTOS ROAD PAVEMENT REHABILITATION**" project, having examined the drawings and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the contract documents, within the time set forth herein, and at the attached unit prices. These price(s) are to cover all expenses incurred in performing the work required under the contract documents, of which this proposal is a part. These price(s) are firm and shall not be subject to adjustment provided this Proposal is accepted within ninety (90) days after the time set for receipt of proposals.

BIDDER hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" to be issued by the OWNER and to fully complete the project within (180) one hundred and eighty calendar days, as defined in the specifications. BIDDER further agrees to pay as liquidated damages, the sum of five hundred ($500.00) dollars for each consecutive calendar day thereafter as hereinafter provided in Article 3 of the Agreement.

BIDDER agrees to perform all work for which he contracts as described in the specifications and as shown on the plans, for the attached unit prices:

SUBCONTRACTORS. BIDDER proposes that he will perform the majority of the work at the project site with his own forces and that specific portions of the work not performed by the BIDDER will be subcontracted and performed by the following subcontractors.

Subcontracted Work	Name of Subcontractor

2023 OSTOS ROAD PAVEMENT REHABILITATION

BIDDER Agrees to perform all the work described in the Contract Documents
for the following Unit Prices (which include any and all applicable taxes and fees):

Tuesday November 28, 2022.

2023 OSTOS ROAD PAVEMENT REHABLITATION

ITEM	D E S C R I P T I O N	EST QTY	UNIT COST	AMOUNT
GENERAL PAVEMENT AREA				
1	TRAFFIC CONTROL	6 MO		
			SUBTOTAL BID FOR GENERAL PAVEMENT AREA:	
FULL RECONSTRUCTION (17" CROSS SECTION)				
2	2" H.M.A.C. PAVEMENT	16,395 SY		
3	7" LIMESTONE BASE W/TX5 GEOGRID	16,878 SY		
4	8" LIMESTONE BASE W/TX5 GEOGRID	17,365 SY		
5	8" SUBGRADE PREP PAVEMENT AREA (PROOF ROLLING)	17,365 SY		
			SUBTOTAL BID FOR FULL RECONSTRUCTION:	
MICRO-MILLING AND OVERLAY				
6	PLANE ASPH CONC PAV (1.5" MICRO-MILLING)	38,370 SY		
7	2" H.M.A.C. PAVEMENT OVERLAY	54,746 SY		
			SUBTOTAL BID FOR MICRO-MILLING AND OVERLAY:	
CONCRETE PAVEMENT				
8	CONCRETE PAVEMENT (CONC. REINF – CRCP)(12")	4,393 SY		
9	6" LIMESTONE BASE	4,580 SY		
10	6" SUBGRADE PREP PAVEMENT AREA (PROOF ROLLING)	4,580 SY		
11	24" R.C.P. STORM SEWER PIPE	216 LF		
12	30" R.C.P. STORM SEWER PIPE	64 LF		
13	SET (TY I)(24 IN)(RCP)(6:1)(C)	6 EA		
14	SET (TY I)(30 IN)(RCP)(6:1)(C)	2 EA		
			SUBTOTAL BID FOR CONCRETE PAVEMENT:	
DRAINAGE IMPROVEMENTS				
15	EXCAVATION (CHANNEL)	787 CY		
16	FURNISHING AND PLACING TOPSOIL (4")	17,680 SY		
17	BROADCAST SEED (PERM)(RURAL)(SANDY)	17,680 SY		
18	CONCRETE PAVEMENT (CONT REINF – CRCP)(8")	36 SY		
19	1" GRAVE DRIVEWAY	74 SY		
20	STRUCT EXCAV (BOX)	2,446 CY		
21	STRUCT EXCAV (PIPE)	15 CY		
22	CEMENT STABILIZED BACKFILL	656 CY		
23	CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)	38 CY		
24	TRENCH EXCAVATION PROTECTION	813 LF		

DRAINAGE IMPROVEMENTS (Continued)				
25	RIPRAP (CONC)(4 IN)	20 CY		
26	CONCRETE BOX CULVERT (6 FT X 4 FT)	797 LF		
27	RC PIPE (CL III)(24 IN)	16 LF		
28	INLET (COMPL)(PSL)(FG)(3FTX3FT-3FTX3FT)	3 EA		
29	INLET (COMPL)(PSL)(FG)(8FTX8FT-3FTX3FT)	1 EA		
30	WINGWALL (PW-1)(HW=8FT)	1 EA		
31	WINGWALL (PW-2)(HW=7FT)	1 EA		
32	SET (TY I)(S=6FT)(HW=4FT)(6:1)(P)	2 EA		
33	REMOV STR (SET)	4 EA		
34	REMOV STR (PIPE)	5 EA		
			SUBTOTAL BID FOR DRAINAGE IMPROVEMENTS:	
			TOTAL BASE BID AMOUNT:	
			TOTAL COST OF MATERIALS:	

DRAINAGE IMPROVEMENTS – ADDITIVE BID				
16A	FURNISHING AND PLACING TOPSOIL (4")	10,509 SY		
17A	BROADCAST SEED (PERM)(RURAL)(SANDY)	10,509 SY		
20A	STRUCT EXCAV (BOX)	292 CY		
22A	CEMENT STABILIZED BACKFILL	440 CY		
23A	CEMENT STABILIZED BACKFILL (INLET OR HM)	32 CY		
24A	TRENCH EXCAVATION PROTECTION	10 LF		
26A	CONC BOX CULVERT (6 FT X 4 FT)	546 LF		
28A	INLET (COMPL)(PSL)(FG)(3FTX3FT – 3FTX3FT)	2 EA		
29A	INLET (COMPL)(PSL)(FG)(8FTX8FT – 3FTX3FT)	1 EA		
31A	WINGWALL (PW-2)(HW=7FT)	-1 EA		
32A	SET (TY I)(S=6FT)(HW=4FT)(6:1)(P)	-1 EA		
35	EMBANKMENT (FINAL)(ORD COMP)(TY A)	34,467 CY		
36	WINGWALL (FW-S)(HW=5FT)	1 EA		
			SUBTOTAL BID FOR ADDITIVE DRAINAGE IMPROVEMENTS:	
			TOTAL BASE BID AMOUNT PLUS ADDITIVE ITEMS:	
			TOTAL COST OF MATERIALS:	

BIDDER Acknowledges receipt of the following addenda:

_____

_____

_____

_____

In case of discrepancy, the unit price amount shall govern.

The above included prices shall include all labor, materials, excavation, bailing, shoring, removal, backfill, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) days after the scheduled closing time for receiving bids.

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

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

Respectfully submitted,

By: _____

Seal affixed here
if BID is by a
Corporation

_____
Title

_____
Address

Attest: _____ _____

Bid Bond

2023 OSTOS ROAD PAVEMENT REHABILITATION

STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF CAMERON §

THAT WE, the undersigned, _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the BROWNSVILLE NAVIGATION DISTRICT, TEXAS, as OWNER in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this _____ day of _____, 20____.

The Condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain BID attached hereto and hereby made a part hereof to enter into a contract in writing, for construction of the

"**2023 OSTOS ROAD PAVEMENT REHABILITATION**" project.

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the form of Agreement attached hereto (properly completed in accordance with said BID) and shall furnish payment and performance bonds for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall furnish insurance certificates, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void. Otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penalty amount of this obligation as herein stated.

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

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

Signed this _____ day of _____, 20____.

_____
Principal

_____
Surety

By: _____

Statement of Non-Collusion

2023 OSTOS ROAD PAVEMENT REHABILITATION

The undersigned hereby certifies that they are duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this BID in collusion with any other Bidder, and that the contents of this BID as to prices, terms or conditions of said BID have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this BID.

Company: _____

Address: _____

Phone: _____

Fax: _____

Bidder: _____
(Signature)

Bidder: _____
(Print Name)

Title: _____
(Print Title)

Signature of Company Officer Authorizing this Bid: _____

Company Officer: _____
(Print Name)

Officer's Title: _____
(Print Title)

Note: This form must be filled out and submitted with the sealed bid.

Disclosure of Interests

2023 OSTOS ROAD PAVEMENT REHABILITATION

The Brownsville Navigation District requires all persons or firms seeking to do business with the District to provide the following information. Every question must be answered. If the question is not applicable, answer with "N/A". Corporations whose shares are publicly traded and listed on national or regional stock exchanges or over-the-counter markets may file a current Securities and Exchange Commission Form 10-K with the District in lieu of answering the questions below. See Definitions.

Firm Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Firm is: ☐ Corporation ☐ Partnership ☐ Sole Owner
☐ Association ☐ Other _____

DISCLOSURE QUESTIONS

If additional space is necessary, please use the reverse side or attach separate sheet (s).

1. State the name of each "employee" of the Brownsville Navigation District having any "ownership interests" constituting 10% or more of the voting stock or shares of the business entity or ownership of $2,500 or more of the fair market value for the business entity or employed by the above "firm".

   Name Title Department

   _____

   _____

   _____

2. State the name of each "official" of the Brownsville Navigation District having any "ownership interests" constituting 10% or more of the ownership in the above named "firm", or employed by the above named "firm".

   Name Title Department

   _____

   _____

   _____

3. State the names of each “Board Member” of the Brownsville Navigation District having any “ownership interests” constituting 10% or more of the ownership in the above named “firm”, or employed by the above named “firm”.

Name	Title	Department
_____		
_____		
_____		

Note: This form must be filled out and submitted with the sealed bid.

2023 OSTOS ROAD PAVEMENT REHABILITATION

CERTIFICATE

I certify that all information provided is true and correct as of the date of this statement, that I have not knowingly withheld disclosure of any information requested; and that supplemental statements will be promptly submitted to the Brownsville Navigation District as changes occur.

Certifying Name: _____

Title: _____

Signature: _____

Date: _____

DEFINITIONS

The following definitions of terms should be used in answering the questions set forth below:

A. "Board Member" – An elected member of any board, commission, or committee appointed by the Brownsville Navigation District of Brownsville, Texas.

B. "Employee" – Any person employed by the Brownsville Navigation District either on a full time or part-time basis, but not as an independent contractor.

C. "Firm" – Any entity operated for economic gain, whether professional, industrial or commercial, and whether established to produce or deal with a product or service, including but not limited to, entities operated in the form of sole proprietorship, as self employed person, partnership, corporation, joint stock company, joint venture, receivership or trust, and entities which for purposes of taxation are treated as non-profit organizations.

D. "Official" – The Chairman, members of the Brownsville Navigation District, General Manager, CEO, Deputy Port Director, Department and Division Heads.

E. "Ownership Interest" – Legal or equitable interest, whether actually or constructive held, in a firm, including when such interest is held through the agent, trust, estate or holding entity. "Consecutively held" refers to holding or control established through voting trusts, proxies, or special terms of venture of partnership agreements.

Please Complete and Submit to:

Chairman of the Board
Brownsville Navigation District
c/o Ariel Chávez II, P.E./ R.P.L.S.
Director of Engineering Services
1000 Foust Road
Brownsville, Texas 78521

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

2023 OSTOS ROAD PAVEMENT REHABILITATION

CERTIFICATE

Name of Entity: _____

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

a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency:

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

c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, Local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and

d) Have not within a three year period preceding this application/bid had one or more public transactions (Federal, State, Local) terminated for cause or default.

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

_____
Name and Title of Authorized Representative (Typed)

_____ _____
Signature of Authorized Representative Date

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

Please Complete and Submit to:

Chairman of the Board
Brownsville Navigation District
c/o Ariel Chávez II, P.E./ R.P.L.S.
Director of Engineering Services
1000 Foust Road
Brownsville, Texas 78521

Contractor's Pre-Bid Disclosure Statement

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Navigation District by:
☐ a Corporation, ☐ a Co- partnership, or ☐ an individual.

   Address: _____ Contractor's #: _____

   City: _____ State: _____ Zip: _____

2. Year's in business under present business name: _____

3. Years of experience in construction work of the type called for in this contract as:
   ☐ a General Contractor ☐ a Sub-Contractor

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

Contract Amount	Type of Work	Date Completed	Owner's Name and Address

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

Contract Amount	Type of Work	Date Completed	Owner's Name and Address

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

_____

_____

7. Are you at present in any major litigation or lawsuits involving construction work of any type?
☐ Yes ☐ No
If "Yes", explain: _____

_____

_____

_____

8. Explain in detail the manner in which you have inspected the work proposed in this Contract:

_____

_____

_____

_____

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

_____

_____

_____

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

11. What experience in this type of work is enjoyed by the individual designated as superintendent above?

_____

_____

_____

12. What portions of the work do you intent to sublet? _____

_____

_____

_____

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

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

14. Have you received firm offers for all major items of material and/or equipment within the prices used in preparing your proposal? ☐ Yes ☐ No

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

Dated this _____ day of _____, 20____.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

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

_____
Notary Public

My commission expires: _____

Subcontractor's Pre-Bid Disclosure Statement

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. This Pre-Bid Disclosure Statement is submitted to the Brownsville Navigation District by:
☐ a Corporation, ☐ a Co- partnership, or ☐ an individual.

   Address: _____ Contractor's #: _____

   City: _____ State: _____ Zip: _____

2. Year's in business under present business name: _____

3. Years of experience in construction work of the type called for in this contract as:
   ☐ a General Contractor ☐ a Sub-Contractor

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

Contract Amount	Type of Work	Date Completed	Owner's Name and Address

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

Contract Amount	Type of Work	Date Completed	Owner's Name and Address

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

   _____

   _____

7. Are you at present in any major litigation or lawsuits involving construction work of any type?
☐ Yes ☐ No
If "Yes", explain: _____

   _____

   _____

   _____

8. Explain in detail the manner in which you have inspected the work proposed in this Contract:

_____

_____

_____

_____

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

_____

_____

_____

10. If this contract is awarded to your prime contractor, your company's administrative manager for the work will be Mr./Ms. _____, and your resident construction superintendent will be Mr./Ms. _____.

11. What experience in this type of work is enjoyed by the individual designated as superintendent above?

_____

_____

_____

12. What portions of the work do you intent to sublet further? _____

_____

_____

_____

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

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

14. Have you received firm offers for all major items of material and/or equipment within the prices used in preparing your proposal? ☐ Yes ☐ No

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

Dated this _____ day of _____, 20____.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

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

_____
Notary Public

My commission expires: _____

BROWNSVILLE NAVIGATION DISTRICT
Bidder's Acknowledgment Form

Having carefully examined the information, notices and specifications and conditions contained in this package, the undersigned Bidder's agent or representative hereby proposes and agrees to comply with these Specifications at the prices quoted. The Bidder affirms that, to the best of their knowledge, the bid has been arrived at independently and is submitted without collusion with anyone to obtain information or gain any favoritism that would in any way limit competition or give them an unfair advantage over other Bidders in the award of this bid.

Addendums received:

_____

_____

_____

_____

Vendor:
Address:
City, State, Zip Code:
Signature of Bidder:
Title with Company:

To Vendors Doing Business with Brownsville Navigation District:

The Texas legislature passed two pieces of legislation that affect the relationship between the Brownsville Navigation District and its vendors. The Board of Commissioners of the Brownsville Navigation District has incorporated these new requirements into the *Code of Ethics* already in place for the District.

The District will now require that any vendor seeking to do business with the Brownsville Navigation District must file certain documents on an annual basis in order to be able to be awarded a purchase contract or a purchase order for goods or services. These forms are:

1. Vendor Registration Form

2. Conflict of Interest Questionnaire

These forms must be re-filed on an annual basis. Copies of the required forms and a full copy of the *Code of Ethics* are available on the District's website at:

www.portofbrownsville.com

Conflict of Interest Questionnaires can be found at the Texas Ethics Commission web site at:

http://www.ethics.state.tx .us/forms/CIQ.pdf

Conflict of Interest Questionnaires must be filed in regard to the Brownsville Navigation District "local government officers" which include the Navigation District Commissioners, the Port Director and CEO and the Deputy Port Directors. A listing of these persons is enclosed. Completed forms are to be filed with my office.

Please do not hesitate to contact me should you have any questions regarding these forms.

Sincerely yours,

Mr. Zeus Yanez,
Director of Finance
(956) 838-7023 Fax (956) 831-5106
zyanez@portofbrownsville.com

encl:

BROWNSVILLE NAVIGATION DISTRICT ADMINISTRATION

"LOCAL GOVERNMENT OFFICERS"

Board of Navigation and Canal Commissioners

Esteban Guerra
Chairman
Elected 5/05/2022
Term Expires May 2026
Private Businessman

Ralph Cowen
Vice Chairman
Elected 5/10/2022
Term Expires May 2024
Private Businessman

John Wood
Secretary
Elected 05/10/2022
Term Expires May 2026
Private Businessman

Sergio Tito Lopez
Commissioner
Elected 05/10/2020
Term Expires May 2024
Private Businessman

John Reed
Commissioner
Elected 5/10/2020
Term Expires May 2024
Banker

Administration

Eduardo A. Campirano – Port Director & CEO
Melinda Rodriguez – Deputy Director of Administration
Arturo Gomez – Deputy Director of Operations

Other Administrative Employees

Open – Senior Director of Marketing and Business Development
Ariel Chàvez II, P.E./R.P.L.S. – Director of Engineering Services
Michael Davis – Harbor Master
Margie Recio – Director of Administrative Services
Zeus Yanez – Director of Finance
Carlos L. Garcia – Chief of Police
Jose Herrera – Director of Facilities Maintenance
Jorge Montero – Director of Communications
Antonio Rodriguez – Director of Cargo Services
Open – Director of Real Estate Services

Brownsville Navigation District
Vendor Registration Form

Please complete this form to give the District your contact information for use during an RFP/RFB process or to open or update a vendor account

Date:	Name of Person Providing Information:
If you are currently participating in an RFP process for the District, please indicate the RFP/RFB title:	

If you are interested in receiving a notice when an RFP/RFB is available, please indicate your areas of interest:

☐ Construction Contracts	☐ Security Services
☐ Property/Liability Insurance	☐ Bank Depository
☐ Group Insurance	Other:
☐ Salvage Offerings	
☐ Uniform Service	

Vendor Name	Web Site
Contact Person:	Fax Number:
Phone Number:	eMail Address:
Mailing Address:	Physical Address:

Form of Business *(Individual/Sole Proprietor/Partnership/Corporation/Other)*	Taxpayer Identification Number:

Please return this form by fax to (956) 831-5106 or by email to vendor@portofbrownsville.com

_____
Signature of Person Providing Information

This vendor is not a Listed Company as per: Section 2252 of the Texas Government Code Federal Debarred List - SAM.gov	_____ Signature of Purchasing Auditor

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire is being filed in accordance with chapter 176 of the Local Government Code by a person doing business with the governmental entity.

By law this questionnaire must be filed with the records administrator of the local government not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. *See* Section 176.006, Local Government Code.

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

OFFICE USE ONLY

Date Received

1 **Name of person doing business with local governmental entity.**

2

☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than September 1 of the year for which an activity described in Section 176.006(a), Local Government Code, is pending and not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Describe each affiliation or business relationship with an employee or contractor of the local governmental entity who makes recommendations to a local government officer of the local governmental entity with respect to expenditure of money.**

4 **Describe each affiliation or business relationship with a person who is a local government officer and who appoints or employs a local government officer of the local governmental entity that is the subject of this questionnaire.**

Amended 01/13/2006

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor or other person doing business with local governmental entity

5 **Name of local government officer with whom filer has affiliation or business relationship. (Complete this section only if the answer to A, B, or C is YES.)**

This section, item 5 including subparts A, B, C & D, must be completed for each officer with whom the filer has affiliation or business relationship. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income from the filer of the questionnaire?

☐ Yes ☐ No

B. Is the filer of the questionnaire receiving or likely to receive taxable income from or at the direction of the local government officer named in this section AND the taxable income is not from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire affiliated with a corporation or other business entity that the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

D. Describe each affiliation or business relationship.

6 **Describe any other affiliation or business relationship that might cause a conflict of interest.**

7

Signature of person doing business with the governmental entity

Date

Texas Government Code Sections 2270.002 and 2252.152

Disclosure Statement

The undersigned business entity hereby represents and warrants that the following statements are true and correct:

(a) Pursuant to Section 2270.002, Texas Government Code, we hereby represent that we do not boycott Israel (as defined in Section 2270.002, Texas Government Code) and, subject to or as otherwise required by applicable Federal law, including, without limitation, 50 U.S.C. Section 4607, we agree not to boycott Israel during the term of this purchase agreement.

(b) We hereby acknowledge that (a) we do not engage in business with Iran, Sudan, or any foreign organization and (b) we are not listed by the Texas Comptroller as described in Section 2252.152, Texas Government Code.

Company Name
Authorized Signature
Print Name and Position with the Company
Date

2023 OSTOS ROAD PAVEMENT REHABILITATION

THIS AGREEMENT is dated as of the _____ day of _____ by and between the **BROWNSVILLE NAVIGATION DISTRICT**, Texas (hereinafter called OWNER), and _____ of _____ (hereinafter called CONTRACTOR).

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

Article 1. WORK.

CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the work described herein and complete all the work as specified or indicated in the Contract Documents. The work is generally described as:

2023 OSTOS ROAD PAVEMENT REHABILITATION
at the Brownsville Navigation District, Texas.
(hereinafter referred to as "Work").

Article 2. ENGINEER.

The project has been designed by the Engineering Department of the Brownsville Navigation District (hereinafter also called ENGINEER) in cooperation with the OWNER.

Article 3. CONTRACT TIME.

3.1 The Work shall be substantially completed within the number of calendar days specified in the Bid Form from issuance of the Notice to Proceed and shall be fully completed within fifteen (15) days after that date.

3.2 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not substantially complete within the time specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the Work is not substantially complete on time. Accordingly, instead of requiring such proof, OWNER and CONTRACTOR agree that as liquidated damages for the delay (but not as a penalty) CONTRACTOR shall pay OWNER five hundred ($500.00) dollars for each calendar day that expires after the time specified in paragraph 3.1 for substantial completion until the Work is substantially complete.

Article 4. CONTRACT PRICE.

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

Article 5. PAYMENT PROCEDURES.

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

5.1 Progress Payments. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about the twentieth day after submittal of the Application for Payment each month as provided below. All progress payments shall be on the basis of the progress of the Work measured by the schedule of values provided for in paragraph 14.1 of the General Conditions.

5.1.1 Prior to Substantial Completion progress payments shall be in an amount equal to 90% of the amount requested in the Application for Payment, with 10% remaining as retainage for the project, to be released in accordance paragraph 5.2.

5.1.2 Upon substantial completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 90% of the Contract Price, less such amounts OWNER shall determine in accordance with paragraph 14.7 of the General Conditions.

5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with paragraph 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by OWNER as provided in said paragraph 14.13.

Article 6. CONTRACTOR'S REPRESENTATIONS.

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

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

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

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

6.4 CONTRACTOR is skilled and experienced in the type of work described in

the Contract Documents.

Article 7. CONTRACT DOCUMENTS.

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

7.1 Advertisement for bids.

7.2 Instructions to Bidders (pages 1 to 9, inclusive).

7.3 Bid Form (pages 1 to 3, inclusive).

7.4 Bid Bond.

7.5 Statement of Non-collusion.

7.6 Disclosure of Interests.

7.7 Certificate and Definitions.

7.8 Certification Regarding Debarment, Suspension, and other Responsibility Matters

7.9 Contractor's Pre-Bid Disclosure Statement (pages 1 to 3, inclusive).

7.10 Subcontractor's Pre-Bid Disclosure Statement (pages 1 to 3, inclusive).

7.11 Respondent’s Acknowledgement Form

7.12 Vendor Registration Form (pages 1 to 3, inclusive)

7.13 Conflict of Interest Questionnaire (pages 1 to 2, inclusive)

7.14 Government Code Chapter 2270 and 2252 Disclosure Statement

7.15 Agreement (pages 1 to 6, inclusive).

7.16 Performance Bond (pages 1 to 3, inclusive).

7.17 Payment Bond (pages 1 to 3, inclusive)..

7.18 Certificates of Insurance.

7.19 General Conditions (pages 1 to 44, inclusive).

7.20 Supplemental General Conditions (pages 1 to 14, inclusive).

7.21 Davis Bacon Wage Rates (pages 1 to 5, inclusive)

7.22 Technical Specifications

Concrete Pipe – Storm Sewer (pages 1 to 2, inclusive).

Earthwork and Site Preparation (pages 1 to 3, inclusive).

Subgrade Preparation (pages 1 to 3, inclusive).

Trench Safety System (pages 1 to 4, inclusive).

Triaxial TX5 General Specifications.

Sanitary Sewer Pipework (pages 1 to 8, inclusive).

Waterline Pipe Work (pages 1 to 7, inclusive)

Asphalt Pavement & Base with TriAx (pages 1 to 6, inclusive)

7.23 Specifications and Drawings – (pages 1 thru 240, inclusive).

7.24 Notice of Award & Acceptance of Notice.

7.25 Notice to Proceed & Acceptance of Notice.

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

Article 8. MISCELLANEOUS.

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

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

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

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

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

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

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

8.8 The Contract Documents constitute the entire agreement between the parties hereto and supersede all prior agreements and understandings between the parties. The Contract can be modified or amended by written agreement of the parties.

8.9 These Contract Documents are governed by the laws of the State of Texas and the parties agree that venue for all lawsuits arising from these Contract Documents shall lie in Cameron County, Texas.

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

This Agreement will be effective on _____.

BROWNSVILLE NAVIGATION DISTRICT _____

By: _____ By: _____

Mr. Esteban Guerra, Chairman

Attest: _____ Attest: _____

Mr. John Wood, Secretary

Address for giving notices: Address for giving notices:

Attn: Mr. Ariel Chávez II, P.E./R.P.L.S., Attn:
Director of Engineering Services
1000 Foust Road
Brownsville, TX 78521

The Brownsville Navigation District is a governmental entity as defined by Texas Tax Code Section 151.309. District takes the position that this contract is exempt from taxation under

Section 151.311 of the Texas Tax Code. The District will provide Contractor with evidence of District's status as a governmental entity, so that Contractor may claim exemption from sales tax for all purchases of tangible personal property used in the performance of this contract. **The parties agree that for purposes of claiming the exemption Contractor is the agent of District within the meaning of 34 Texas Administrative Code Rule 3.322**. However, District and Contractor further agree that (1) to the extent this contract or purchases made to fulfill this contract are taxable, that this is a "separated contract", and that the following amount of money represents that part of the total contract price representative of the value of tangible personal property to be physically incorporated into the project realty: $ _____, and (2) in no event shall District be liable to Contractor for an increase in the Contract Price because of sales taxes.

Performance Bond

2023 OSTOS ROAD PAVEMENT REHABILITATION

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal,
(Corporation, Partnership, or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)

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

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the ____ day of _____, 20___, a copy of which is hereto attached and made a part hereof, for the construction of the:

_____
_____
_____
_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year post-construction guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

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

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

This bond is subject to and governed by Article 5160 of the Texas Revised Civil Statues and all amendments thereto.

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

ATTEST: _____
(Principal)

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

(SEAL)

_____ _____
(Witness as to Principal) (Address)
_____ _____
(Address)
_____

ATTEST: _____
(Surety)

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

(SEAL)

_____ _____
(Witness as to Surety) (Address)
_____ _____
(Address)
_____

NOTE: Date of BOND must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute BOND.

ATTACH

POWER OF ATTORNEY

TO BE FURNISHED BY CONTRACTOR

Payment Bond

2023 OSTOS ROAD PAVEMENT REHABILITATION

KNOW ALL MEN BY THESE PRESENTS:

THAT _____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal,
(Corporation, Partnership, or Individual)

and _____
(Name of Surety)

_____
(Address of Surety)

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

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the ____ day of _____, 20__, a copy of which is hereto attached and made a part hereof, for the construction of the _____.

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

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

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

This bond is subject to and governed by Article 5160 of the Texas Revised Civil Statues and all amendments thereto.

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

ATTEST: _____
(Principal)

_____ By: _____
(Principal) Secretary (Signature)

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____

ATTEST: _____
(Surety)

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

(SEAL)

_____ _____
(Witness as to Surety) (Address)

_____ _____
(Address)

_____

NOTE: Date of BOND must not be prior to date of Contract. If Contractor Partnership, all partners should execute BOND.

ATTACH

POWER OF ATTORNEY

TO BE FURNISHED BY CONTRACTOR

2023 OSTOS ROAD PAVEMENT REHABILITATION

ATTACH

CERTIFICATES OF INSURANCE

TO BE FURNISHED BY CONTRACTOR

2023 OSTOS ROAD PAVEMENT REHABILITATION

STANDARD

GENERAL CONDITIONS

OF THE

CONSTRUCTION CONTRACT

Prepared by

Engineers' Joint Contract Documents Committee

and

Issued and Published Jointly By

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

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

CONSTRUCTION SPECIFICATION INSTITUTE

The document has been approved and endorsed by:

The Associated General Contractors of America

TABLE OF CONTENTS OF GENERAL CONDITIONS

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GENERAL CONDITIONS

ARTICLE 1. DEFINITIONS

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

Addenda - Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents. These Addenda shall become a part of the Contract Documents and modify the drawings, specifications or other bid documents as indicated. No verbal changes in the Work as shown or described shall become binding.

Agreement - The written agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

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

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

Bonds - Bid, performance and payment bonds and other instruments of security.

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

Contract Documents - The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all amendments, modifications and supplements issued pursuant to paragraphs 3.4 and 3.5 on or after the Effective Date of the Agreement.

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

Contract Time - The number of days (computed as provided in paragraph 17.2) or the date stated in the Agreement for the completion of the Work.

CONTRACTOR - The person, firm or corporation with whom OWNER has entered into

the Agreement.

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

Drawings - The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by OWNER.

ENGINEER - The person, firm or corporation named as such in the Agreement.

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

General Requirements - Sections of Division 1 of the Specifications.

Laws and Regulations; Laws or Regulations - Laws, rules, regulations, ordinances, codes and/or orders.

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

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

OWNER - The public body or authority, corporation, association, firm or person with whom Contractor has entered into the Agreement and for whom the Work I to be provided.

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

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

Resident Project Representative - The authorized representative of ENGINEER who is assigned to the site or any part thereof.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are

specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.

Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

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

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

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

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

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

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

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

Work Directive Change - A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.22. A Work Directive Change may not change the Contract Price or the Contract Time, but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in paragraph 10.2.

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

ARTICLE 2. PRELIMINARY MATTERS

Delivery of Bonds:

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

Copies of Documents:

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

Commencement of Contract Time; Notice to Proceed:

2.3 The Contract Time will commence to run on the thirieth day after the after the effective Date of the Agreement, or if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Time commence to run later than the seventy fifth day after the day the of Bid opening or the thirieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Project:

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

Before Starting Construction:

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

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

2.6.1 an estimated progress schedule indicating the starting and

completion dates of the various stages of the Work;

2.6.2 a preliminary schedule of Shop Drawings submissions; and

2.6.3 a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by CONTRACTOR at the time of submission.

2.7 Before any Work at the site is started, Contractor shall deliver to Owner, with a copy to Engineer, certificates (and other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.3, 5.4, and Owner shall deliver to CONTRACTOR certificates (and other evidence of insurance requested by CONTRACTOR) which 0WNER is required to purchase and maintain in accordance with paragraphs 5.6 and 5.7.

Preconstruction Conference:

2.8 Within twenty days after the Effective Date of the Agreement, but before CONTRACTOR starts the Work at the site, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to discuss the schedules referred to in paragraph 2.6, to discuss procedures for handling Shop Drawings and other submittals and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

Finalizing Schedules:

2.9 At least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to finalize the schedules submitted in accordance with paragraph 2.6. The finalized progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance will neither impose on ENGINEER responsibility for the progress or scheduling of the Work nor relieve CONTRACTOR from full responsibility therefor. The finalized schedule of Shop Drawing submissions will be acceptable to ENGINEER as providing a workable arrangement for processing the submissions. The finalized schedule of values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

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

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work,

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

3.3 If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall so report to ENGINEER in writing at once and before proceeding with the Work affected thereby shall obtain a written interpretation or clarification from ENGINEER. However, CONTRACTOR shall be not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents if CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

Amending and Supplementing Contract Documents:

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

3.4.1 a Formal Written Amendment,

3.4.2 a Change Order (pursuant to paragraph 10.4), or

3.4.3 a Work Directive Change (pursuant to paragraph 10.1).

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

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

3.5.1 a Field Order (pursuant to paragraph 9.5),

3.5.2 ENGINEER's approval of a Shop Drawing or sample (pursuant to paragraphs 6.26 and 6.27), or

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

Reuse of Documents:

3.6 Neither CONTRACTOR nor any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER; and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER. All drawings, specifications or other documents (or copies of any thereof) are upon completion of the project to become the property of OWNER. Further use thereof without written consent of OWNER is prohibited.

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

Availability of Lands:

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

Physical Condition:

4.2.1 Explorations and Reports: Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, but not upon nontechnical data, interpretations or opinions contained therein or for the completeness thereof for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to subsurface conditions at the site.

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

4.2.3 Report of Differing Conditions: If CONTRACTOR believes that:

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

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

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

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

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

4.2.6 Possible Price and Time Adjustments: In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, may be allowable to the extent that they are attributable to any such inaccuracy or difference. If OWNER and CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

Physical Conditions - Underground Facilities:

4.3.1 Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

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

4.3.1.2 CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owners of such Underground Facilities during construction, for the safety and protection thereof as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work, the cost of all of which will be considered as having been included in the Contract Price.

4.3.2 Not Shown or Indicated. If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be aware of, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.22), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document the consequences of the existence of the Underground Facility, and the Contract Documents will be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be aware of. If the parties are unable to agree as to the amount or length thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

Reference Points:

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

ARTICLE 5. BONDS AND INSURANCE

Performance and Other Bonds:

5.1 CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect at least until one year after the date when final payment becomes due, except as otherwise provided by Law or Regulation or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by Law or Regulation or by the Contract Documents and be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the

project is located or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within five days thereafter substitute another Bond or Surety, both of which must be acceptable to OWNER.

Contractor's Liability Insurance:

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

5.3.1 Claims under workers' or workmen's compensation, disability benefits and other similar employee benefit acts;

5.3.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

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

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

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

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

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

The insurance required by these paragraphs 5.3 and 5.6 shall include the specific coverages and be written for not less than the limits of liability and coverages provided in the Supplementary Conditions, or required by law, whichever is greater. The comprehensive general liability insurance shall include completed operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and ENGINEER by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two years after final payment and

furnish OWNER with evidence of continuation of such insurance at final payment and one year thereafter.

Contractual Liability Insurance:

5.4 The comprehensive general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's obligations under paragraphs 6.30 and 6.31.

Owner's Liability Insurance:

5.5 Owner shall be responsible for purchasing and maintaining ONWER'S own liability insurance and, at OWNER's option, may purchase and maintain such insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6 Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEER's consultants in the Work, all of whom shall be listed as insureds or additional insured parties, shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment.

5.7 OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTR, Subcontractors, ENGINEERS and ENGINEER's consultants in the Work, all of whom shall be listed as insured or additional insured parties.

5.8 All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be cancelled or materially changed or renewal refused until at least thirty days prior written notice has been given to CONTRACTOR by certified mail and will contain waiver provisions in accordance with paragraph 5.11.2.

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

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

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

Waiver of Rights:

5.11.1 OWNER and CONTRACTOR waive all rights against each other for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to paragraph 5.6 and 5.7 and any other property insurance applicable to the Work, and also waives all such rights against the Subcontractors. ENGINEER, ENGINEER's consultants and all other parties named as insureds in such policies for losses and damages so caused. As required by paragraph 6.11, each subcontract between CONTRACTOR and a Subcontractor will contain similar waiver provisions by the Subcontractor in favor of OWNER, CONTRACTOR, ENGINEER, ENGINEER's consultants and all other parties named as insureds. None of the above waivers shall extend to the rights that any of the insured parties may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy is issued.

5.11.2 OWNER and CONTRACTOR intend that any policies provided in response to paragraph 5.6 and 5.7 shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insureds or additional insureds, and if the insurers require separate waiver forms to be signed by ENGINEER or ENGINEER's consultant or any Subcontractor, CONTRACTOR will obtain the same, and if such waiver forms are required of any Subcontractor, CONTRACTOR will obtain the same.

Receipt and Application of Proceeds:

5.12. Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with OWNER and made payable to OWNER as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. OWNER shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreements is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13. OWNER as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as trustee shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, OWNER as trustee shall, upon the occurrence of any insured loss, give bond for the proper performance of such duties.

Acceptance of Insurance:

5.14. If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3 and 5.4 on the basis of its not complying with the Contract Documents, OWNER shall notify CONTRACTOR in writing thereof within ten days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.7. If CONTRACTOR has any objection to the coverage afforded by or other provisions of the policies of insurance required to be purchased and maintained by OWNER, in accordance with paragraphs 5.6 and 5.7 on the basis of their not complying CONTRACTOR shall notify OWNER in writing thereof within ten days of the date of delivery of such certificates to CONTRACTOR in accordance with paragraph 2.7. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided by each as the other may reasonably request. Failure by OWNER or CONTRACTOR to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by the other as complying with the Contract Documents.

Partial Utilization - Property Insurance:

5.15. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10 provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent to such use or occupancy by endorsement on the policy or policies, but the property insurance shall not be cancelled or lapse on account of any such partial use or occupancy.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be responsible to see that the finished Work complies accurately with the Contract Documents.

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

Labor, Materials and Equipment:

6.3. CONTRACTOR shall provide competent, suitably qualified personnel to survey

and lay out the Work and perform construction as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

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

6.5. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective to assign to ENGINEER, or any of ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.15 or 9.16.

Adjusting Progress Schedule:

6.6. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) adjustments in the progress schedule to reflect the impact thereon of new developments; these will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

Substitutes or "Or-Equal" Items:

6.7.1. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by ENGINEER if sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named. The procedure for review by ENGINEER will include the following as supplemented in the General Requirements. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitute will not prejudice CONTRACTOR's achievement of

Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's expense additional data about the proposed substitute.

6.7.2. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER, if CONTRACTOR submits sufficient information to allow ENGINEER to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in paragraph 6.7.1 as applied by ENGINEER and as may be supplemented in the General Requirements.

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

Concerning Subcontractors, Suppliers and Others:

6.8.1. CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials and equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for

acceptance or objection in the bidding documents or the Contractor Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price may be increased by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. All increases or decreases in the Contract Price shall be governed by all state and local statutes, codes, laws, ordinances, rules and regulations governing competitive bidding and Change Orders. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

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

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

6.11. All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER and contains waiver provisions as required by paragraph 5.11. CONTRACTOR shall pay each Subcontractor a just share of any insurance moneys received by CONTRACTOR on account of losses under policies issued pursuant to paragraphs 5.6 and 5.7.

Patent Fees and Royalties:

6.12. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and anyone directly or indirectly employed by either of them from and against claims, damages, losses and expenses (including attorneys' fees and court costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

Permits:

6.13. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or if there are no Bids on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

Laws and Regulations:

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

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

Taxes:

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

Use of Premises:

6.16. CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or any of the land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against OWNER or ENGINEER by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify, hold OWNER and ENGINEER harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or

equitable, brought by any such other party against OWNER or ENGINEER to the extent based on a claim arising out of CONTRACTOR's performance of the Work.

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

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

Record Documents:

6.19. CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Directive Changes, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents, together with all approved samples and a counterpart of all approved Shop Drawings, will be available to ENGINEER for reference. Upon completion of the Work, these record documents, samples and Shop Drawings will be delivered to ENGINEER for OWNER.

Safety and Protection:

6.20. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1. all employees on the Work and other persons and organizations who may be affected thereby;

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

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

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in

part, by OWNER and ENGINEER, and by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.21. CONTRACTOR shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

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

Shop Drawings and Samples:

6.23. Not Used

6.24. Not Used

6.25 Not Used

6.26. ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but ENGINEER’s review and approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incidents thereto. The review and approval of a separate item as such will not indicate approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.27. ENGINEER’s review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER’s attention to each such variation at the time of submission as required by paragraph 6.25.2 and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawings or sample approval; nor will any approval by ENGINEER

relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.25.1

6.28. Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER's review and approval of the pertinent submission will be the sole expense and responsibility of CONTRACTOR.

Continuing the Work:

6.29. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as CONTRACTOR and OWNER may otherwise agree in writing.

Indemnification:

6.30. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and their consultants, agents and employees from and against all claims, damages, losses and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (a)is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, or regardless of whether or not it is caused in part by a party indemnified hereunder or arises by or is imposed by Law and Regulations regardless of the negligence of any such party.

6.31. In any and all claims against OWNER or ENGINEER or any of their consultants, agents or employees by any employee of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.30 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor or other person or organization under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

6.32. The obligations of CONTRACTOR under paragraph 6.30 shall not extend to the liability of ENGINEER, ENGINEER's consultants, agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications.

ARTICLE 7 - OTHER WORK

Related Work at Site:

7.1. OWNER may perform other work related to the Project at the site by OWNER's own forces, have other work performed by utility owners or let other direct contracts therefor which shall contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to CONTRACTOR prior to starting any such other work; and, if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the extent thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

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

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

Coordination:

7.4. If OWNER contracts with others for the performance of other work on the Project at the site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Supplementary Conditions, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, in the Supplementary Conditions. Unless otherwise provided in the Supplementary Conditions, neither OWNER nor ENGINEER shall not have any authority or responsibility in respect of such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.1. OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under

the Contract Documents shall be that of the former ENGINEER. Any dispute in connection with such appointment shall be subject to arbitration.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly after they are due as provided in paragraphs 14.4 and 14.13.

8.4. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and in existing structures which have been utilized by ENGINEER in preparing the Drawings and Specifications.

8.5 OWNER's responsibility in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.6.

8.6. OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7. OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

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

ARTICLE 9 -ENGINEERS STATUS DURING CONSTRUCTION

Owner's Representative:

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

Visits to Site:

9.2. ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations as an experienced and qualified design professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work.

Project Representation:

9.3. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project

Representative to assist ENGINEER in observing the performance of the Work. The duties, responsibilities and limitations of authority of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions. If OWNER designates another agent to represent OWNER at the site who is not ENGINEER's agent or employee, the duties, responsibilities and limitations of authority of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations:

9.4. ENGINEER, after consultation with OWNER, will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification or interpretation justifies an increase in the Contract Price or an extension of the Contract Time and the parties are unable to agree to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Article 11 or Article 12.

Authorized Variations in Work:

9.5. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER, and also on CONTRACTOR who shall perform the Work involved promptly. If CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

Rejecting Defective Work:

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

Shop Drawings, Change Orders and Payments:

9.7. In connection with ENGINEER's responsibility for Shop Drawings and samples, see paragraphs 6.23 through 6.28 inclusive.

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

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

Determinations for Unit Prices:

9.10. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR ENGINEER's

preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decisions thereon will be final and binding upon OWNER and CONTRACTOR, unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other party to the Agreement and to ENGINEER written notice of intention to appeal from such a decision.

Decisions on Disputes:

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

9.12. When functioning as interpreter and judge under paragraphs 9.10 and 9.11, ENGINEER will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 and 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

Limitations on ENGINEER's Responsibilities:

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

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

9.15. ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs

incident thereto and ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

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

ARTICLE 10 - CHANGES IN THE WORK

10.1. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2. If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Work Directive Change, a claim may be made therefor as provided in Article 11 or Article 12.

10.3. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.4 and 3.5, except in the case of an emergency as provided in paragraph 6.22 and except in the case of uncovering Work as provided in paragraph 13.9.

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

10.4.1. changes in the Work which are ordered by OWNER pursuant to paragraph 10.1, are required because of acceptance of defective Work under paragraph 13.13 or correcting defective Work under paragraph 13.14, or are agreed to by the parties;

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

10.4.3. changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

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

adjusted accordingly.

ARTICLE 11 - CHANGE OF CONTRACT PRICE

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

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

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

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

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

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

Cost of the Work:

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

11.4.1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe

benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday ay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

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

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

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

11.4.5. Supplemental costs including the following:

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

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

11.4.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof--all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

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

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

11.4.5.6. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

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

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

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by OWNER in accordance with paragraph 5.9.

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

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

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

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

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

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

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

CONTRACTOR's Fee:

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

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

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

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

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

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

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

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

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

Cash Allowances:

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

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

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

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

Unit Price Work:

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

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

11.9.3. Where the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement and there is no corresponding adjustment with respect to any other item of Work and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof. CONTRACTOR may make a claim for an increase in the Contract Price in accordance with Article 11 if the parties are unable to agree as to the amount of any such increase.

ARTICLE 12 - CHANGE OF CONTRACT TIME

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

12.2. The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR if a claim is made therefor as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts or neglect by OWNER or others performing additional work as contemplated by Article 7, or to fires, floods, labor disputes, epidemics, abnormal weather conditions or acts of God.

12.3. All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court costs) for delay by either party.

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

Warranty and Guarantee:

13.1. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects shall be given to CONTRACTOR. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. ENGINEER and ENGINEER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide proper and safe conditions for such access.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals.

13.4. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish ENGINEER the

required certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or ENGINEER's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or if materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals other than those which are required by the Contract Documents shall be paid by OWNER (unless otherwise specified).

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

13.6. If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

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

Uncovering Work:

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

13.9. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges or engineers, architects, attorneys and other professionals), and OWNER shall be entitled to an appropriate decrease in the Contract Price, and if the parties are unable to agree as to the amount thereof, may make a claim therefor as provided in Article 11. If, however, such Work is not found to be defective, CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

Owner May Stop the Work:

13.10. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been

eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work:

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

One Year Correction Period:

13.12. If within one year after the date of issue of the Certificate of Acceptance or such longer period of time as may be prescribed by Laws or Regulations, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instruction, either correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with nondefective Work. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service before acceptance of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

Acceptance of Defective Work:

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

OWNER May Correct Defective Work:

13.14. If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days'

written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees such access to the site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies will be charged against CONTRACTOR in an amount approved as to reasonableness by ENGINEER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1. The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2. At least twenty days before each progress payment is scheduled (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3. CONTRACTOR warrants and guarantees that title to all Work, materials and

equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.4. OWNER will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to make payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. Ten days after presentation of the Application for Payment with ENGINEER's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

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

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

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

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

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

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

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

OWNER may refuse to make payment in whole or in part of the amount recommended by ENGINEER because claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work or Liens have been filed in connection with the Work or there are other items entitling OWNER to a set-off against the amount recommended, but OWNER must give CONTRACTOR written notice (with a copy to ENGINEER) stating the reasons for such action.

Substantial Completion:

14.8. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have ten days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within twenty days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said twenty days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

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

Partial Utilization:

14.10. Use by OWNER of any finished part of the Work, which has specifically been identified in the Contract Documents or which OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER without significant interference with CONTRACTOR's performance of the remainder of the Work,

may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

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

14.10.3. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.15 in respect of property insurance.

Final Inspection:

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

Final Application for Payment:

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents--all as required by the Contract Documents, and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible, have been paid or otherwise satisfied; and consent of the surety, if any, to final payment. If any Subcontractor or Supplier fails to furnish a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

Final Payment and Acceptance:

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

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

Contractor's Continuing Obligation:

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

Waiver of Claims:

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

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

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

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1. OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both; directly attributable to any suspension if CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

Owner May Terminate:

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

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

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

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

15.2.4. if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR's creditors;

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

15.2.6. if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 29. as revised from time to time);

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

15.2.8. if CONTRACTOR disregards the authority of ENGINEER; or

15.2.9. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

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

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

15.4. Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work

and terminate the Agreement. In such case, CONTRACTOR shall be paid for all Work executed and any expense sustained plus reasonable termination expenses, which will include, but not be limited to, direct, indirect and consequential costs (including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs).

15.5. If through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted, or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR, may upon seven days written notice to OWNER and ENGINEER terminate the Agreement and recover from OWNER payment for all Work executed an any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or OWNER has failed to make any payment as aforesaid, CONTRACTOR may upon seven day's written notice to OWNER and ENGINEER stop the Work until payment of all amounts then due. The provisions of this paragraph shall not relieve CONTRACTOR of the obligations under paragraph 6.29 to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with OWNER.

ARTICLE 16 (Reserved)

ARTICLE 17 - MISCELLANEOUS

Giving Notice:

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

Computation of Time:

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

17.2.2. A calendar day of twenty-four hours measured from midnight to the next midnight shall constitute a day.

General:

17.3. Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a

waiver of the provisions of any applicable statute of limitations or repose.

17.4. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the conditions, warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.30, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to OWNER and ENGINEER which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, conditions, warranties and guarantees made in the Contract Documents will survive the execution, final payment and termination or completion of the Agreement. All statements contained in any document required by OWNER, whether delivered at the time of the execution of the Contract Documents or at a later date, shall constitute representations, warranties and guarantees herein.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. GENERAL

The Standard General Conditions of the construction Contract prepared by the ENGINEER's Joint Contract documents Committee (No. 1910-8 1990 Edition) shall form a part of this contract, together with the following Supplementary General Conditions. A copy of the Standard General Conditions (No. 1910-8) is bound herewith.

The following supplements modify, change, delete, or add to the General Conditions, where any part of the General Conditions is modified or voided by these articles, the unaltered provisions of that part shall remain in effect.

2. DETAILED AMENDMENTS TO THE GENERAL CONDITIONS

The following Articles of the Standard General Conditions are hereby amended as follows:

ARTICLE 1: The definition for Contract Documents is hereby amended to insert the word "General and Supplementary General Conditions", after the word "Agreement"

ARTICLE 2: Add the following definitions:

a. Standard abbreviations: Wherever reference is made to standard specifications, standard of quality or performance, as established by a recognized national authority, the reference may be by initials as generally recognized throughout the authority.

b. Addenda: Supplements to, change in or corrections to the Drawings and/or Specifications issued in writing by the Engineer during the period of bidding. These addenda shall become a part of the contract and modify the Drawings and/or Specifications as indicated. No verbal changes in the work as shown or described shall becoming binding.

c. Alternates: Additions, omissions from, or changes to requirements for the project, each of which shall be bid separately and shall be included in or omitted from the contract at the discretion of the owner.

d. Furnish: To supply at the job site the material, equipment, etc., referred to. Installation is not required of the supplier by the Specifications, but shall be arranged for by the General CONTRACTOR.

e. Provide: To furnish and install in the location shown or approved at the job site, the material, equipment, etc., referred to.

ARTICLE 5: BONDS AND INSURANCE

Delete the last sentence of Article 5.1 delaying with U.S. Treasury Department Listing and substitute the following:

All the surety companies providing bonds for this project must be registered with the Secretary of State of the State of Texas.

Add to Article 5.3 the following subparagraphs:

5.3.1. COMPENSATION INSURANCE. The Contractor shall procure and shall maintain during the life of this Contract, Workmen's Compensation Insurance for all of his employees to be engaged in work on this project under this Contract, and in case of any such work sublet, the CONTRACTOR shall require the subcontractor similarly to provide Workmen' Compensation Insurance for all the latter's employees to be engaged in such work unless employees are covered by the protection afforded by the CONTRACTOR's Compensation Insurance. In case of any class of employees engaged in hazardous work on the project, under this Contract and is not protected under the Workmen's Compensation Statute, the CONTRACTOR shall provide and shall cause each subcontractor to provide adequate insurance for employees not otherwise protected.

Worker's Compensation	Which Complies with the Texas Workers Compensation Act as well as all Federal acts applicable to the Contractor's operation at the site.
Employer's Liability	$1,000,000.00 for each occurrence.

5.3.2. CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE. The Contractor shall procure and shall maintain during the life of this contract CONTRACTOR's Public Liability Insurance for injuries, including accidental death, to any one person, and subject to the same limit for each person, on account of one accident, and CONTRACTOR's Property Damage Insurance in amount as follows:

Comprehensive General Liability	$1,000,000.00 Combined Single Limit ($ 4,000,000.00 if explosives are involved in the performance of the contract)

Including: Bodily Injury Liability, Personal Injury Liability, Property Damage Liability, Broad Form Property Damage Liability, Contractual Liability, Products/Completed Operations Liability, Liability for Property of Others in the Care, Custody and Control of the Contractor.

Comprehensive Automobile Liability	$1,000,000.00 Combined Single Limit

5.3.3. SUBCONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE. The CONTRACTOR shall require each of his subcontractors to procure and to maintain, during the life of this subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type in subparagraph.

5.3.4. Hereof, in amounts approved by the OWNER.

5.3.5. SCOPE OF INSURANCE AND SPECIAL HAZARDS. The insurance required under subparagraph 5.3.2. and 5.3.3. hereof shall provide adequate protection for the Contractor and his subcontractors respectively against damage claims which may arise from

operations under this Contract, whether such operations be by the insured or by anyone against any special hazards which may be encountered in the performance of this contract.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

Add to subparagraph 6.5:

The CONTRACTOR shall notify the OWNER in writing of any conflict between the Manufacturer's directors and the Contract Documents and shall not perform any work on any item until such conflict has been resolved.

Upon reward of the Contract, the OWNER will, on written request of the CONTRACTOR, furnish the CONTRACTOR with a certificate of exemption from the Limited Sales, Excise and Use Tax in an amount not exceeding the above mentioned bid price for materials or property have been or will be utilized in the performance of the Contract to the full extent of the amount for which a certificate of exemption is requested.

Add the following Subparagraph:

6.3.3. The CONTRACTOR shall acquaint himself with all matters and conditions concerning site and existing construction. Any practical criticism or exception regarding feature of the work presented in writing with the Proposal will be considered at that time. If no criticism or exception is given with the Proposal, it shall be assumed that the Contractor agrees that the project, as outlined in the Drawings and Specifications, can be completed satisfactorily. After a Contract Agreement to perform the work has been signed by the CONTRACTOR, it shall then be his responsibility to provide satisfactory work that will meet the full intent of the Contract Documents. The CONTRACTOR shall then pursue this work with the other trades so that all phases of the work may be properly coordinated without delays or damage to any parts of the work.

ARTICLE 13. WARRANTY AND GUARANTEE: TESTS AND INSPECTIONS: CORRECTIONS, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.

Add the following Subparagraph:

13.1 Disputes over Improper Functioning. In case of dispute as to the cause of improper functioning of all or any part of the work, the burden of proof that he has complied with the Contract Documents rests with the CONTRACTOR for this work. He shall submit in writing his opinion of the cause of his recommendation for proving the adequacy of his work. The OWNER shall have those tests made, which he deems advisable, by an independent testing laboratory of this choice. If any tests so made indicate a defect in material or workmanship, or that one or more manufactured components of the work are performing below the standard set by the manufacturer's published data and specifications, the entire cost of all such tests shall be paid for the by the CONTRACTOR, and he shall also pay for retesting of the corrected work until it functions satisfactorily.

ARTICLE 14. PAYMENTS AND COMPLETION.

Add the following to Paragraph 14.1 1:

A qualified person representing the CONTRACTOR shall be present at this final inspection to demonstrate the systems and prove the performance of the equipment. Prior to this inspection, all work shall have been completed, tested, balanced and adjusted and in final operating condition.

Make the following change to Paragraph 14.4 "Approval of Payments"

OWNER shall, within twenty (20) days of presentation to him of an approved application for Payment, pay Contractor the amount approved by Engineer.

ARTICLE 16. ARBITRATION. Delete this entire Article.

Add the following Article.

ARTICLE 18. THE CONTRACTOR SHALL COMPLY WITH THE COMPELAND ACT 48, STATUTE 948 AND ALL AMENDMENTS OR MODIFICATIONS OF THE ORIGINAL ACT OF JUNE 13,1934.

3. TEMPORARY FACILITIES

(a) Sanitary Facilities for Workmen

(1) CONTRACTOR, shall provide and maintain suitable weathertight, painted sanitary toilet facilities for all workmen for the entire construction period. Comply with all requirements of applicable health authorities. When toilet facilities are no longer required, promptly remove from the site, disinfect and clean the area as required.

(2) CONTRACTOR shall keep toilet facility swept and supplied with toilet tissue at all times.

(b) Weather Protection

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

(c) Work Areas

(1) The CONTRACTOR shall be confined to all working easements provided. Storage of excavation material and all contractor equipment and material shall remain within the limits of working easements.

4. TEMPORARY UTILITIES

The CONTRACTOR shall furnish all temporary utilities as required, for the completion of the work.

5. CONSTRUCTION SEQUENCE

(1) That the following sequence of work be used as a basis for preparation to the Construction Schedule.

(2) To cooperate with and facilitate the Contractor in the whole of the work to be carried out subject to the following being observed:

(a) The CONTRACTOR shall, within five (5) calendar days after the date of the Award of Contract, submit a Construction Schedule for the approval of the Owner and Engineer. This Schedule shall outline an orderly sequence of construction as required to meet the completion time stipulated in the contract.

(b) The CONTRACTOR shall coordinate his work with that of other contractors whose work may occur at a conflicting time and location. The coordination shall be such that work will be maintained at a normal rate.

(c) Satisfactory access or detour roads shall be provided where necessary due to construction.

6. MEASUREMENT

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

7. PROTECTION

a. The CONTRACTOR shall send proper notices, make all necessary arrangements and perform all other services required for the care, protection and maintenance of all public utilities, including fire plugs, telephone and telegraph poles and wires, and all other items of this character on or about the site, assuming all responsibility and paying all costs for which the OWNER may be liable.

b. Temporary Drainage. The CONTRACTOR shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep the excavation free of water.

c. Bracing, Shoring and Sheeting. The CONTRACTOR shall provide all shoring, bracing. and sheeting as required for safety and for the proper execution of the work; and have same removed when the work is completed.

d. Fires shall not be built on the premises except by the express consent of the

OWNER and City Fire Marshall.

8. CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

a. The CONTRACTOR shall not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the OWNER, nor shall the CONTRACTOR allow any subcontractor to commence work on this Contract until the insurance required of the subcontractor has been so obtained and approved.

b. Compensation Insurance. The CONTRACTOR shall procure and shall maintain, during the life of his Contract, Workmen's Compensation Insurance for all of his employees to be engaged in work on this project under this Contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all the latter's employees to be engaged in such work unless employees are covered by the protection afforded by the CONTRACTOR's Compensation.

Insurance. In case of any class of employees engaged in hazardous work on the project under this Contract is not protected under the Workmen's Compensation Statute, the CONTRACTOR shall provide and shall cause each subcontractor to provide adequate insurance for employees not otherwise protected.

c. CONTRACTOR's Public Liability and Property Damage Insurance. The CONTRACTOR shall procure and shall maintain during the life of this contract, Contractor's Public Liability Insurance for injuries, including accidental death, to any one person, and subject to the same limit for each person, on account of one accident, and CONTRACTOR's Property Damage Insurance in amounts as follows:

Comprehensive General Liability	$1,000,000.00 Combined Single Limit ($ 4,000,000.00 if explosives are involved in the performance of the contract)

Including: Bodily Injury Liability, Personal Injury Liability, Property Damage Liability, Broad Form Property Damage Liability, Contractual Liability, Products/Completed Operations Liability, Liability for Property of Others in the Care, Custody and Control of the Contractor.

Comprehensive Automobile Liability $1,000,000.00 Combined Single Limit

NOTE: Automobile insurance shall cover all automobiles and trucks owned by the CONTRACTOR.

d. Subcontractor's Public Liability and Property Damage Insurance. The CONTRACTOR shall require each of his subcontractors to procure and maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type specified in subparagraph C hereof, in amounts approved by the OWNER.

e. Proof of Carriage of Insurance. The CONTRACTOR shall furnish the OWNER with certificates showing the type, amount class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statements. "The insurance covered by this certificate will not be concealed or materially altered except after ten days written notice has been received by the OWNER.

9. ACCIDENT PREVENTION

Precaution shall be exercised at all times for the protection of persons (including employees) and property, and hazardous conditions shall be guarded against or eliminated.

10. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

a. It is hereby understood and mutually agreed, by and between the parties hereto, that the date of beginning, rate of progress and the time for completion of the work to be done thereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed, by and between the parties hereto, that the work embraced in this Contract shall be commenced on a date to be specified in the work order.

b. The CONTRACTOR agrees that said work shall be prosecuted regularly, diligently, and uninterrupted at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the parties hereto, that the time for the completion of the work described herein is a reasonable time for completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in the locality.

c. If the said CONTRACTOR shall neglect, fail or refuse to complete the work within the time herein specified, then the said Contractor does hereby agree, as a part consideration for awarding of this Contract, not as a penalty but as liquidated damages for such breach of calendar day that the CONTRACTOR shall be in default after the time stipulated in the Contract for completing the work.

d. The Damage to OWNER by reason of this contract not being completed as of that date are parties hereto have therefore fixed and limited such damages to the amount stated in the agreement per day for each day the job runs beyond such date and the fixing of such damages constitutes a part of the consideration for the Contract.

e. It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where, under the Contract, additional time is allowed for the completion of any work, the new time fixed by such extension shall not be charged with liquidated damages or any excess cost when the delay in the completion of work is due:

(1) To any preference, priority or allocation order duly issued by the Government.

(2) To enforceable cause, beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to, acts of God, or the public enemy, acts of the OWNER, acts of another Contractor in the performance of the Contract with OWNER, fires, floods, epidemics, Quarantine restriction, strikes, freights embargoes, and unusually severe weather.

(3) To any delays of subcontractors and/or material suppliers occasioned by any of the causes specified in (1) and (2).

(4) Provided, further, that the Contractor shall, within seven (7) days from the beginning of such delay, notify the OWNER, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the CONTRACTOR within a reasonable time of its decision in the matter.

11. INSPECTION AND TESTING OF MATERIALS

a. All materials and equipment/furnished by manufacturers shall be tested, inspected, and certified in accordance with the Contract Documents, laws, ordinances, or any public authority requiring any work to be specifically tested. The cost of such tests, inspections and certifications shall be borne by the CONTRACTOR.

b. The CONTRACTOR shall cooperate with the testing laboratory to the end that the function and services of the laboratory may be properly performed. The Contractor shall give the OWNER's representative and testing laboratory a minimum of twenty-four (24) hour notice of readiness for all testing as required. Costs of all field tests by such a laboratory shall be borne by the OWNER, unless otherwise stipulated in the Supplementary General Conditions, Article 13.

12. REFERENCE POINTS

The ENGINEER will establish horizontal and vertical controls only (reference points and benchmarks) as shown on the construction plans.

The CONTRACTOR must notify the ENGINEER at least 48 hours prior to starting work on any section or part of the work where controls have not been established or are not identifiable or visible to the CONTRACTOR.

The ENGINEER will upon such advance notice assist the CONTRACTOR in locating and identifying the various CONTRACTOR in location and identifying the various control points and will replace any control points that have been destroyed by others prior to beginning of CONTRACTOR's operations.

After the control points are established and/or identified as outlined above, maintenance of such control points will be the responsibility of the CONTRACTOR. Any re-staking required for any reason thereafter shall be the final responsibility of the CONTRACTOR.

The CONTRACTOR will provide all other construction staking (cut stakes, blue topping, intermediate string line control, etc.) required to verify grades, depths, thickness and alignment of the various items of construction.

13. SERVICES AT START UP

The CONTRACTOR shall provide the services of technical representative, for the CONTRACTOR furnished equipment, for a sufficient period to assist in start up and initial adjustment of all equipment and to train, advice and consult with the OWNER's operating personnel.

14. PERMITS

Permits, fees and licenses necessary for the pursuit of the work shall be obtained and paid for by the CONTRACTOR.

15. MAINTENANCE OF SITE AND CLEANUP

The work site shall be kept reasonably clean at all times. Surplus materials shall be disposed of by the CONTRACTOR except for the designated to be salvaged. In final cleanup operations, all equipment, scrap materials and temporary structures shall be removed and the site left clean.

16. PROTECTION AND REPLACEMENT OF PROPERTY

Driveways, culverts, storm sewer inlets and laterals, and other public or private property that is destroyed or removed during the construction shall be replaced to its original condition by the CONTRACTOR. Temporary drainage is to be provided as necessary.

17. CONSTRUCTION AREA

CONTRACTOR shall be responsible to maintain and protect in good condition while under construction and exposed areas that become damage shall be CONTRACTOR's responsibility to repair at no cost to owner. This includes construction area being exposed to rainfall, vehicular traffic, etc.

CONTRACTOR shall be responsible for providing temporary access in a safe and approved manner at all times to private properties being affected by this work. After work is complete, any damages, alterations or modifications to existing structures as part of the temporary access construction activities shall be restored to original conditions or repaired as necessary at the sole expense of the CONTRACTOR.

18. PROTECTION OF TREES, AND SHRUBS

Care shall be exercised to prevent damage to trees, plants and shrubs along the work site. No tree, plant or shrub shall be removed unless it interferes unduly with the construction work. Permission for such removal must first be obtained from the ENGINEER. Provisions of the Technical Specifications shall govern in matters of this nature.

19. BARRICADES AND WARNINGS

Adequate barricades and warning devices shall be provided at the work site. Lights shall be provided between sunset and sunrise when necessary in the opinion of the ENGINEER

in accordance with the Traffic Controllers Manual.

20. LOCATION OF & DAMAGE TO EXISTING UTILITIES AND STRUCTURES

The CONTRACTOR is Responsible for locating underground obstacles. It is not represented that the Plans show all sewers, water lines, gas lines, telephone lines, and other underground obstacles. The CONTRACTOR shall exercise caution to prevent damage to existing facilities during the progress of the construction work, taking care to locate same, where possible, in advance of the actual work. The ENGINEER will render all assistance possible to the CONTRACTOR in the matter of determining the location of existing utilities by making available such maps, records and other information as may be accessible to him, when requested to do so, but the accuracy of such information will not be guaranteed. The CONTRACTOR shall make good on all damage to existing utilities resulting from his operations. Where a pipe, duct or other structure of a utility is exposed, which, in the opinion of the ENGINEER requires strengthening, altering or moving, the CONTRACTOR shall perform such work on same, as the ENGINEER may order, which work will be paid for as extra work in accordance with the terms of the Contract relating to extra work. Should the CONTRACTOR, in the layout of his work, encounter any pipe, underground utility, or structure, the location of which has not been furnished to him by the ENGINEER, he shall bring such conditions to the attention of the ENGINEER for his determination of the method to be used to remove or bypass such obstructions.

It is essential that in the event of any damage being caused to existing units then immediate attention be given to their repair, if necessary at the expense of labor and material scheduled to be employed at the new work. Any repair work carried out shall be at the cost of the CONTRACTOR and shall be to the complete satisfaction of the OWNER, who will acknowledge the same in writing.

It is therefore the duty of the CONTRACTOR prior to the commencement of construction to inspect and accurately record in writing to the OWNER and ENGINEER, the conditions of any unit which he reasonably suspect or knows to be damaged, faulty, or defective.

In addition, any such unit(s) so recorded, which in the opinion of the Contractor may deteriorate further as a result of the proposed mode of operations should be protected and/or remedial measures employed as agreed to, and at the cost of the Owner.

21. MATERIALS AND WORKMANSHIP

No material which has been used by the CONTRACTOR for any temporary purpose whatsoever is to be incorporated in the permanent structure without written consent of the ENGINEER. Where materials or equipment are specified by a trade for brand name, it is not the intention of the Owner to discriminate against an equal product of another manufacturer, but rather to set a definite standard of quality or performance and to establish an equal basis for the evaluation of bids. Where the words "equivalent", "proper" or "equal to" are used, they shall be understood to mean that the thing referred to shall be properly the equivalent of or equal to some other thing, in the opinion of judgment of the ENGINEER. Unless otherwise specified, all materials shall be of the best of their respective kinds and shall be in all cases fully equal to the approved samples.

Notwithstanding that the words "or equal to" or other such expressions may be used in the

Specifications in connection with a material, manufactured article or process, the material, article or process specifically designated shall be used, unless a substitute shall be approved in writing by the ENGINEER, and the ENGINEER shall have the right to require the use of such specifically designated material, article or process.

22. CUTTING, PATCHING AND FITTING

The CONTRACTOR shall perform all cutting, patching, or fitting of this work that met be required to make its several parts come together properly and fit it to receive or be received by work or others shown on, or reasonably implied to the drawings and Specifications for the completed structure or facility. The CONTRACTOR shall not endanger any work by cutting, digging or otherwise, and shall not cut or alter the work of others unless specifically noted on the drawings and specifications or authorized in writing by the ENGINEER and the OWNERS of such other work.

23. RIGHT OF ENTRY

The OWNER reserves the right to enter the property or location on which the work herein contracted for is to be constructed or installed, by such agents as it may elect, for the purpose of supervising and inspecting the work, or for the purpose of constructing or installing collateral work as said OWNER may desire.

24. SUPERINTENDENT AND INSPECTION BY OWNER

It is agreed by the CONTRACTOR that the OWNER shall be and is hereby authorized to appoint from time to time subordinate engineers, supervisors, or inspectors, as the said OWNER may deem proper, to inspect the material furnished and work done under this agreement, and to see that the said material is furnished and said work is done in accordance with the Specifications. The CONTRACTOR shall regard and obey the directions and instructions of any sub-coordinate engineers, supervisors, or inspectors as appointed, when such directions are consistent with the obligations of this agreement and these accompanying Specifications, provided, however, that should the CONTRACTOR object to any order by any subordinate engineer, supervisor, or inspector, the CONTRACTOR may, within six (6) days, make written notice to the ENGINEER for his decision. Except, as herein before provided, the authority of subordinate engineers, supervisors, or inspectors shall be limited to the rejection of unsatisfactory work and materials and to the suspension of the work, until the question of acceptability can be referred to the ENGINEER.

25. SUPERINTEDENT BY CONTRACTOR

Except where the CONTRACTOR is an individual and gives his personal superintendent to the work, the CONTRACTOR shall provide a competent superintendent, satisfactory to the OWNER and the ENGINEER, on the work at all times during working hours with full authority to act from him. The CONTRACTOR shall provide an adequate staff for the proper coordination and expediting of his work.

The CONTRACTOR shall provide an on-site representative, satisfactory to the OWNER and the ENGINEER, available at all times (i.e., twenty-four (24) hours per day, seven (7) days per week). The on-site representative shall be stationed close enough to be on the

site within 30 minutes of notification. The on-site representative shall have full access to all equipment and material and have full authority necessary to correct any problems, deficiencies, or emergencies which may arise during non-working hours and during the absence of the superintendent.

The name, address, and phone number of both the superintendent and the on-site representative shall be given in writing to the ENGINEER and the Local Public Agency prior to the beginning of construction.

Additional provisions concerning superintendent by the CONTRACTOR are given in General Condition 102 of these Contract Documents.

26. "AS BUILT" DRAWINGS – Not Required

A complete set of contract drawings shall be stapled together and the official "As Built" set on which the CONTRACTOR shall record currently the work carried out through all phases of construction.

The set shall be kept in the office in a neat and clean condition and be available for inspection by the OWNER or ENGINEER at any time during the Contract period. At the completion of the Contract it shall be handed to the ENGINEER accompanied by a letter stating that each drawing has been signed by the CONTRACTOR to the effect that the drawings are a true and accurate record of the work carried out.

27. ACCEPTANCE AND FINAL PAYMENT

Upon written notice that the work is ready for inspections and acceptance, the OWNER shall promptly make such inspection, and when he finds the work acceptable under the Contract fully performed, he shall promptly issue a final certificate over his own signature, stating that the work provided for in this Contract has been completed and is accepted by him under the terms and conditions thereof, and the entire balance found to be due the CONTRACTOR, including the retained percentages, shall be paid to the CONTRACTOR at the office of the OWNER within fifteen (15) days after the date of said final certificate. The CONTRACTOR shall submit satisfactory evidence to the OWNER that all payrolls, material bills, and other indebtedness connected with the work have been paid before the final certificate is issued.

The making and acceptance of the final payment shall constitute a waiver of all claims by the OWNER, other than those arising from unsettled liens, from faulty work appearing after final payment or from requirements of the Specifications, and of all claims by the CONTRACTOR, except those previously made and still unsettled.

28. GUARANTEE

The work shall be guaranteed to be free from defects due to faulty workmanship or materials for a period of one year from the date of issue of the Certificate of Acceptance. Work found to be improper or imperfect shall be replaced or drone without cost to the OWNER within the year guarantee period. Neither the Certificate nor Acceptance, final payment, of any provision of the Contract Documents shall free the CONTRACTOR from his guarantee. Failure to repair or replace faulty work entitles the OWNER to repair or

replace the same and recover the costs from the CONTRACTOR and/or his Surety. The CONTRACTOR shall be the sole guarantor of the work installed under this contract and no third party guarantees by subcontractors or suppliers of various components or materials will be acceptable, nor shall agreements with subcontractors or material or component suppliers by the CONTRACTOR reduce the CONTRACTOR's responsibility under this agreement. The Performance Bond shall remain in full force and effect through the guarantee period.

29. PREFERENCE IN EMPLOYMENT

Preference employment shall be given to resident citizens of the area where such persons are available and fully qualified to perform the work to which the employment relates.

30. ANTI-KICKBACK REGULATIONS

The CONTRACTOR shall comply with the Copeland Act 48, Statute 948 and all amendments or modifications of the original act of June 13, 1934.

31. CONTRACTOR'S RESPONSIBILITY

Nothing in these documents shall be constructed as relieving the CONTRACTOR of sole responsibility for coordinating all work, work schedules, and securing proper interface between the various trades, and Subcontractors.

32. BRAND NAMES

The items listed by brand name are to indicate level of quality only and are not a propriety name. They should have added to the listing of a brand name the phrase- "Or Equal".

33. OPERATIONS & MAINTENANCE LITERATURE

All items of equipment required for this contract shall be bid to provide and include as part of the price, literature explaining "Operation & Maintenance" of that item of equipment. If a manufacturer does not print such a standard O & M Manual approved, in writing, by the Manufacturer.

34. MODIFICATIONS OR BID OR WITHDRAWAL PRIOR TO OPENING

At any time prior to bid opening, the CONTRACTOR may, after handing in or submitting his bid, obtain his bid for purposes of modification or withdrawal. Bid opening is defined at the time and date at which bids are received and publicly opened. No bid will be received after that time and date.

35. RETAINAGE AND PROGRESS PAYMENTS

OWNER will make monthly progress payments to CONTRACTOR in response to properly submitted and approved pay requests utilizing the format included in this project manual. Amount due each pay request shall be equal to the Gross amount of work completed to date, less five percent (5%) retainage, less previous payments made on the project.

2023 OSTOS ROAD PAVEMENT REHABILITATION

DAVIS-BACON WAGE RATES TX180008 01/05/2018 TX8

General Decision Number: TX180008 01/05/2018 TX8

Superseded General Decision Number: TX20170008

State: Texas

Construction Types: Heavy and Highway

Counties: Cameron, Hidalgo and Webb Counties in Texas.

HEAVY & HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018

* SUTX2011-003 08/02/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER (Paving & Structures)	$ 12.46	
FORM BUILDER/FORM SETTER (Structures)	$ 12.30	
FORM SETTER (Paving & Curb)	$ 12.16	
LABORER		
Asphalt Raker	$ 10.61	
Flagger	$ 9.10	
Laborer, Common	$ 9.86	
Laborer, Utility	$ 11.53	
Pipelayer	$ 11.87	
Work Zone Barricade Servicer	$ 12.88	

POWER EQUIPMENT OPERATOR:

Asphalt Distributor	$ 13.48
Asphalt Paving Machine	$ 12.25
Broom or Sweeper	$ 10.33
Crane, Lattice Boom 80 Tons or Less	$ 14.39
Crawler Tractor	16.63
Excavator, 50,000 lbs or less	$ 12.56
Excavator, over 50,000 lbs	$ 15.23
Foundation Drill, Truck Mounted	$ 16.86
Front End Loader Operator, Over 3 CY	$ 13.69
Front End Loader, 3 CY or less	$ 13.49
Loader/Backhoe	$ 12.77
Mechanic	$ 15.47
Milling Machine	$ 14.64
Motor Grader Operator, Rough	$ 14.62
Motor Grader, Fine Grade	$ 16.52
Scraper	$ 11.07

Servicer ..... $ 12.34

Steel Worker (Reinforcing) ..... $ 14.07

TRUCK DRIVER

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

WELDER ..... $ 14.02

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies

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

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

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations

Wage and Hour Division

U.S. Department of Labor

200 Constitution Avenue, N.W.

Washington, DC 20210

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

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

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

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SEQUENCE OF WORK**: The Contractor shall plan the work to expeditiously accomplish the pavement improvements and other appurtenant work. It is not the intent of the Owner to destroy or in any way invade the locations of utilities in place. If any difficulties are encountered, the Contractor shall be responsible to bring it to the attention of the Engineer immediately. Surplus dirt removed from excavation necessary to the construction shall be disposed of by the Contractor. However, where instructed by the Engineer or the Owner, the Contractor shall dispose of surplus dirt as desired by the landowner.

2. **DESCRIPTION**. This item shall consist of the placing, treatment and compacting of the Limestone flexible base, and placing of a surface course of hot mix asphaltic concrete as herein specified and in conformance with typical sections, lines and grades shown on the plans and defined by the Engineer.

Subgrade Preparation is described in the specification for "Subgrade Preparation", pages SP - 1 through SP - 3.

3. **MATERIALS**.

3.1. **Limestone Base**. The material for the Base Course shall be Crushed Limestone, crushed as needed to meet the requirements hereinafter specified, and shall consist of durable coarse aggregate mixed with an approved proportion of Binder Material. The limestone shall conform to the requirements of Type "A" State Grade Crushed Limestone, as specified by "Item 247 – Flexible Base", of the Texas State Department of Highways and Public Transportation, 1982 Standard Specification for Construction of Streets and Bridges, and shall meet the physical requirements as follows:

3.1.1. Strength: A minimum strength of 50 CBR shall be achieved on the Crushed Limestone Base.

3.1.2. Gradation.

Retained on 1-3/4" square sieve	0%
Retained on 7/8" square sieve	10% to 35%
Retained on 3/8" square sieve	30% to 50%
Retained on #4 sieve	45% to 65%
Retained on #40 sieve	70% to 85%

3.1.3. Material Passing the #40 sieve shall be known as "Binder Material", and shall meet the following requirements:

Maximum Liquid Limit (L.L.)	35%
Maximum Plasticity Index (P.I.)	10%

3.2. **TX5 Triaxial GeoGrid Mechanical Stabilization**. Each Limestone Base material layer shall be combined with one layer of polymeric TX5 Triaxial GeoGrid grid structure comprised of a regular network of integrally connected, multidirectional tensile elements of

appropriate orientation, size and shape with triangular apertures of the size specified to allow interlocking with the unbound Limestone Base materials. The combination of the two materials shall create an improved or modified composite layer with significantly improved properties and performance capabilities.

3.2.1. Limestone Base Mechanical Stabilizer: GeoGrid. The Limestone Base Mechanical Stabilizer, or Structural Base Material Reinforcement, shall be TriAxial TX5 GeoGrid. The grid shall be integrally formed and produced from a punched sheet of polypropylene which is oriented in three substantially equilateral directions so that the resulting ribs have a high degree of molecular orientation, which continues at least in part through the mass of the integral node.

3.2.2. The GeoGrid structure shall have apertures that are triangular in shape, and shall have ribs with depth-to-width ratios greater than 1.0.

3.2.3. The geogrid shall have the typical characteristics shown in the table below, and shall be certified in writing by the manufacturer to be TX5 or approved equivalent:

TX5 GeoGrid Characteristics

Properties	Longitudinal	Diagonal	Transverse	General
Rib pitch, mm (in)	40 (1.60)	40 (1.60)	-	
Mid-rib depth, mm (in)	-	1.4 (0.06)	1.2 (0.05)	
Mid-rib width, mm (in)	-	1.0 (0.04)	1.1 (0.04)	
Rib shape				rectangular
Aperture shape				triangular

3.3. **Hot Mix Asphaltic Concrete**. The hot mix asphaltic concrete shall conform to the requirements of the Texas State Department of Highways and Public Transportation 1982 Specifications, Item 340. The paving mixture to be used shall be the type designated on the plans. The Contractor shall provide appropriate documentation from the producer and a commercial laboratory that the hot mix asphaltic concrete used meets these requirements. The asphalt to be used shall be AC-20, 5% to 8% by weight, with a minimum Hveem Stability of 30. Aggregate retained on No. 4 sieve shall be 100% crushed limestone.

4. **CONSTRUCTION METHODS**:

4.1. **Limestone Base**. Construction methods for the Limestone base shall conform to T.H.D. Spec. #249 “Flexible Base (Delivered)”. The Contractor shall not place Limestone on the roadbed until the Engineer has accepted the shaped and compacted subgrade.

The Contractor shall maintain the roadbed free of holes, ruts and depressions and in conditions to receive the Limestone. The Limestone base shall be compacted to at least 98% of Standard Proctor density to the full required thickness.

The first density and depth test at a specific location shall be made by a commercial testing laboratory designated by the Owner and said tests shall be paid for by the Owner. If the test fails, all other tests at that location shall be paid for by the Contractor.

4.2. **TX5 Triaxial GeoGrid**.

4.2.1. The Contractor shall inspect the GeoGrid upon delivery to confirm that the proper material has been received. The Contractor shall make sure that the GeoGrid is free of flaws or damage that may have occurred during manufacturing, shipping, or handling.

4.2.2. The Subgrade Soil or previous Limestone Base layer shall be prepared as indicated on the construction drawings or as directed by the Engineer. The GeoGrid shall be placed after the previous soil or base layer has been shaped to grade as required in the construction documents, and density and surface texture has been approved by the Engineer or the inspector. The GeoGrid shall be placed longitudinally on the roadway subgrade or base. Each GeoGrid strip shall overlap no less than 6" with the adjacent GeoGrid strip. No material shall be placed on top of a GeoGrid layer until approved by the Engineer or the inspector.

4.2.3. The GeoGrid shall be installed in accordance with the plans and specifications and any installation guidelines provided by the manufacturer or as directed by the Engineer.

4.2.4. The GeoGrid may be temporarily secured in place with ties, staples, pins, sand bags or backfill as required by fill properties, fill placement procedures or weather conditions or as directed by the Engineer.

4.2.5. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the GeoGrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the GeoGrid. When underlying substrata is trafficable with minimal rutting, rubber-tired equipment may pass over the GeoGrid reinforcement at slow speeds (less than 5 mph). Sudden braking and sharp turning movements shall be avoided.

4.3. **Hot Mix Asphaltic Concrete**. The prime coat, tack coat or the asphaltic mixture when placed with a spreading and finishing machine, shall not be placed when the air temperature is below 50 deg F and is falling, but it may be placed when the air temperature is above 50 deg F and is rising. The air temperature shall be taken in the shade away from artificial heat. It is further provided that the prime coat, tack coat, or asphaltic mixture shall be placed only when the humidity, general weather conditions, and temperature and moisture condition of the base, in the opinion of the Engineer, are suitable. If the temperature of the asphaltic mixture of a load or any part of a load becomes less than 225 deg F. or more than 350 deg F after being dumped from the mixer and prior to passing through the lay-down machine, all or any part of the load may be rejected.

4.3.1. Prime Coat. After the Limestone base has been laid to grade, and is approved by the Engineer or the Inspector, a prime coat shall be applied at the rate shown on the plans. The asphaltic material shall be as specified in the plans. The application temperature shall be as provided above. The tack coat for asphaltic concrete specified below shall not be applied on a previously primed flexible base until the primed base has completely cured to the satisfaction of the Engineer.

4.3.2. Tack Coat. Before the asphaltic mixture is laid, the surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer. The surface shall be given a uniform application of tack coat using asphaltic materials specified in the plans. This tack coat shall be applied, as directed by the Engineer, with an approved

sprayer at a rate not less than 0.05 (not to exceed 0.15) gallons per square yard of surface. All contact surfaces of inlet structures and all joints shall be painted with a thin uniform coat of the asphaltic material meeting the requirements for tack coat. The tack coat shall be rolled with a pneumatic tire roller when directed by the Engineer.

4.3.3. Transporting Asphaltic Concrete. The asphaltic mixture, prepared as specified above, shall be hauled to the work in tight vehicles previously cleaned of all foreign material. The dispatching of the vehicles shall be arranged so that all material delivered may be placed, and all rolling shall be completed during daylight hours. In cool weather or for long hauls, canvas covers and insulating of the truck bodies may be required. The inside of the truck body may be given a light coating of oil, lime slurry or other material satisfactory to the Engineer, if necessary, to prevent mixture from adhering to the body.

4.3.4. Placing.

4.3.4.1. Generally, the asphaltic mixture shall be dumped and spread on the approved prepared surface with specified spreading and finishing machine, in such manner that when properly compacted the finished pavement shall be smooth, of uniform density and shall meet the requirements of the typical cross sections and the surface tests. During the application of asphaltic material, care shall be taken to prevent splattering of adjacent pavement, and structures.

4.3.4.2. When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be eliminated when authorized by the Engineer, provided a satisfactory surface can be obtained by other approved methods.

4.3.4.3. Flush Structures. Adjacent to flush structures, the surface shall be finished uniformly high so that when compacted it shall be slightly above the edge of the flush structure.

4.3.5. Compacting.

4.3.5.1. Rolling with the three wheel and tandem rollers shall start longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the rear wheel unless otherwise directed by the Engineer. Rolling with pneumatic-tire roller shall be done as needed. Rolling shall be continued until no further compression can be obtained and all roller marks are eliminated. One tandem roller, one pneumatic-tire roller, and at least one three wheel roller, as specified above shall be provided for each job. If the Contractor elects, he may substitute the three axle tandem roller and/or the three wheel roller; but in no case shall less than three rollers be in use on each job. Additional rollers shall be provided if needed. The motion of the roller shall be slow enough at all times to avoid displacement of the mixture. If any displacement occurs, it shall be corrected at once by the use of rakes and of fresh mixtures where required. The roller shall not be allowed to stand on pavement which has not been fully compacted. To prevent adhesion of the surface mixture to the roller, the wheels shall be kept thoroughly moistened with water, but an excess of water will not be permitted. All rollers must be in good mechanical condition. Necessary precautions shall be taken to prevent the

dropping of gasoline, oil, grease or other foreign matter on the pavement, either when the rollers are in operation or when standing.

In lieu of the rolling equipment specified, the Contractor may, upon written permission from the Engineer, operate other compacting equipment that will produce equivalent relative compaction as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction as would be expected of the specified equipment, as determined by the Engineer, its use shall be discontinued.

4.3.6. Opening to Traffic. The pavement shall be opened to traffic when directed by the Engineer. If the surface ravels, it shall be the Contractor's responsibility to correct this condition at his expense.

4.3.7. Density Testing - Acceptance, Sampling and Testing of Hot Mix Asphaltic Concrete (Compaction). Hot Mix Asphaltic Concrete will be accepted for density on a lot basis. A lot shall consist of one day's production or 1,200 tons, whichever is less and shall be divided into four equal sublots. One test shall be made for each sublot.

Each lot of pavement will be accepted, with respect to density, when the average field density is equal to or greater than 92% of the average maximum theoretical density as determined in accordance with ASTM D2041, and when no individual determination is less than 91.0% of the average maximum theoretical density. Four field density determinations shall be made for each lot. Cores or sawed samples taken from the pavement shall be used to determine the field density. The density of the cored or sawed samples shall be determined in accordance with ASTM D2726.

The same specimen shall be used for determining both the maximum theoretical density and field density. Specimens used for field density determination shall be carefully crumbled, using heat if necessary, and maximum theoretical density determined in accordance with ASTM D2041. If heating is necessary, the specimen shall be heated to the lowest temperatures required for proper preparation of the sample.

The use of nuclear field density determination shall not be used as the basis for acceptance with respect to density.

4.3.8. Surface Tests. Tests for conformity with the specified crown and grade shall be made by the Contractor immediately after final rolling. Any variation exceeding the specified tolerances shall immediately be corrected by removing the defective work and replacing with new material, as directed by the Engineer. Any correction required shall be at the sole expense of the Contractor.

For surface course, the finished surface shall not vary more than 1/4 inch (6.35 mm) when tested with a 16 ft. straightedge applied parallel with, or at right angles to, the centerline.

The finished surfaces of hot mix asphaltic concrete shall not vary from the grade line, elevations and cross sections shown on the plans by more than 1/2 inch (12.7 mm). The Contractor shall correct pavement areas varying in excess of this amount by removing and replacing the defective work. Skin patching shall not be permitted for correction of low areas nor shall planing be permitted for correction of high areas.

4.3.9. Sampling Pavement. Samples for determination of thickness and density of completed asphaltic pavement surface shall be obtained by the testing laboratory. The size, number and locations of the samples will be as directed by the Engineer. Samples shall be neatly cut with a saw, core drill or other approved equipment. The Contractor shall, after coring the pavement, provide all labor and materials for patching the core holes as soon as practicable. The owner will cover the costs of initial testing. However, the costs for any retesting due to failed tests shall be borne by the Contractor.

All tests necessary to determine conformance with the specified requirements will be performed without cost to the Contractor. However, any required retests due to failed tests shall be paid for by the Contractor.

5. **MEASUREMENT**:

5.1. Measurement of "Subgrade Preparation" shall be by the subgrade area actually completed, of each thickness as specified on the construction drawings and in the Bid Proposal. Unit shall be in square yards.

5.2. Measurement of "Limestone Base w/TX5 GeoGrid" shall be by the base area actually completed, of each thickness as specified on the construction drawings and in the Bid Proposal. Unit shall be in square yards.

5.3. Measurement of "Limestone Base" shall be by the base area actually completed, of each thickness as specified on the construction drawings and in the Bid Proposal. Unit shall be in square yards.

5.4. Measurement of "H.M.A.C. Pavement" (Hot Mix Asphaltic Concrete Pavement) shall be by the paved area actually completed, of the thickness specified on the construction drawings and in the Bid Proposal. Unit shall be in square yards.

6. **PAYMENT**:

6.1. The work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard of "Subgrade Preparation", of "Limestone Base w/TX5 GeoGrid", of "Limestone Base", and of "Hot Mix Asphaltic Pavement", of each of the thicknesses specified in the Construction Drawings and in the Bid Proposal.

6.2. The unit bid price shall be full compensation for furnishing all material, subgrade preparation, Limestone, Tri-Axial TX5 GeoGrid fabric, freight, heating, mixing, hauling, cleansing of the existing subgrade course, base course or pavement, tack coat, placing asphaltic concrete mixture, rolling and finishing, and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work to the thicknesses and compaction levels indicated in the drawings, and in conformance with all the provisions of these specifications.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **DESCRIPTION**. This item shall govern the trench excavation, furnishing concrete Sewer Pipe of the diameters and dimensions and types as shown on the plans, installing said pipe to the lined and grades shown on the plans, backfilling the trenches and disposal of surplus excavated material.

2. **MATERIALS**. All materials shall conform to T.H.D. Spec. #464 "Reinforced Concrete Pipe Culverts".

Reinforced concrete pipe (RCP) shall conform to ASTM Designation C76, Class V, with mortar or rubber gasket joints.

Plain heavy wall pipe (HWP) shall conform to ASTM Designation C14, Class 3, with mortar or rubber gasket joints.

The Contractor may use in lieu of mortar joint Ram-Nek Flexible Plastic Gasket, or approved equal, meeting Federal Specifications No. SS-S-00210 "Sealing Compounds, Preformed Plastic for Pipe Joints, Type 1 Rope Form".

3. **CONSTRUCTION METHODS**. Construction methods for concrete sewers shall conform to T.H.D. Spec. #464.

The trench for the sewer pipe shall be excavated to lines and grades shown on the plans or as established by the Engineer. Special care shall be taken not to excavate below the established grade for the bottom of the pipe. If for any reason it is necessary to excavate below the established grade, the trench bottom shall be brought to grade by backfilling with suitable material approved by the Engineer and thoroughly compacting the fill.

No pipe shall be used which is cracked, checked, spilled or damaged or which in any way fails to meet the specifications. The pipe shall be laid so that spigot points in the direct of flow, and if feasible, laying shall start from the lowest point. All pipe shall be laid with spigot centered in the hub and shall be fitted and matched to provide a smooth uniform invert. The inside of the pipe shall be kept clean of foreign material.

Each layer of backfill material shall be at the moisture content required to obtain the proper density, and shall be compacted to the required density by means of mechanical tamps or rammers, except that the use of rolling equipment of the type generally used in compacting embankments will be permitted on those portions which are accessible to such equipment. All backfill required to complete the work shall be compacted by either rolling equipment or mechanical tamps or rammers. Hand tamping will not be accepted as an alternative to mechanical compaction. Care shall be taken to prevent any wedging action of backfill against the pipe.

OR

The Contractor may backfill by placing a layer of dirt no tot exceed 2 feet and water tamping the layer by placing water slowly from the bottom up and obtain additional compaction by the use of either standard mechanical tamps or by dropping a heavy weight.

Regardless of compaction method used, bedding and backfill materials and compacted densities shall be as shown on the plans.

4. **GUARANTEE**. The Contractor will inspect the finished job with a representative of the City ever 90 days for a period of one year after the job has been accepted. If any settlement is found, the contractor shall repair the area at his expense within 7 days after written notice. The performance bond will be in effect for the duration of this guarantee.

5. **MEASUREMENT**. Concrete Pipe will be measured by the linear foot, in place, of the various types and sizes, installed as specified above, in the various depths of trench.

The depth of the trench, where applicable, shall be measured as the vertical distance, in feet, from the original natural ground to the flow line of the pipe. Depth shall be considered in payment only if the Bid Proposal so indicates.

6. **PAYMENT**. Work performed and materials furnished as prescribed by this item, measured as provided above, will be paid for at the contract Unit Price Bid for the various sizes, types, and depths (where indicated), of Concrete Sewer Pipe shown in the Bid Schedule, which price shall be full compensation for all excavation, fine-grading, furnishing, hauling and installing Concrete Sewer Pipe, joint material, concrete, backfill, and disposal of excess excavated material, and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SCOPE**. This section shall cover the furnishing, laying, jointing and testing of all water pipe, including water appurtenances, both in open cut and in tunnels, as shown on the drawings or as directed by the Engineer.

2. **MATERIALS**. The material used in pipework shall be furnished by the contractor, as approved by the Engineer to meet the requirements of the work of the contractor as specified herein.

2.1. **Water Pipe**. Water pipe for main lines may be of any of the following classifications. Any pipe found defective, not meeting the specifications or improperly installed shall be rejected and so marked and shall be replaced by pipe approved by the Engineer at no additional cost to the Owner.

2.1.1. Polyvinyl chloride (PVC) pipe for waterlines 16" in diameter shall conform to or exceed Uni-Bell PVC Pipe Association Specification "Polyvinyl Chloride (PVC) Transmission Pipe (Nominal diameters 14-36 inch)" UNI-B-11-84.

2.1.2. Polyvinyl chloride (PVC) pipe for waterlines 6 inch to 12 inch shall conform to or exceed AWWA Standard "Polyvinyl Chloride (PVC) Pressure Pipe" C900, Class 100 DR-25, or Class 150 DR-150 DR-18, latest revision.

2.1.3. Polyvinyl chloride (PVC) pipe for waterlines 4 inch and smaller shall be Schedule 40 PVC and shall conform to or exceed ASTM Standard "Polyvinyl Chloride (PVC) Plastic Pipe" D 1785, latest revision.

2.2. **Waterline Fittings**. Fittings for water lines may be of any of the following classifications. All fittings shall be wrapped in a plastic protector in conformance with AWWA Standard C-105 and ANSI A21.5 "Polyethylene Encasement for Gray and Ductile Cast-Iron piping for Water and Other Liquids". Fitting wrapping shall be installed in such a manner as to curtail or prevent corrosion of the metallic fittings. Any fittings found defective, not meeting the specifications, or improperly installed, shall be rejected and so marked, and shall be replaced by fittings approved by the engineer, at no additional cost to the Owner.

2.2.1. Fittings for polyvinyl chloride (PVC) pipe 4 inch through 12 inch shall meet AWWA Standard C-110 or C-153 "Ductile-Iron Compact Fittings, 3 inch through 12 inch for Water and Other Liquids", and C-104, latest revision, and shall be sized to fit PVC water pipe in conformance with 2.1.1. No adapter for fittings with outside diameters different from PVC pipe shall be used. Only Mechanical Joint fittings shall be acceptable.

2.2.2. Fittings for polyvinyl chloride (PVC Schedule 40 pipe less than 4 inch shall conform to ASTM Standard D2466, latest revision.

2.3. **Service Connections**. Water service connections shall be installed with rubber gasket double strap bronze saddles. "Modified" double strap saddles will not be acceptable substitutes. The service lines and casings shall be of the following classifications. Any material found defective, not meeting the specifications, or improperly installed shall be rejected and so marked and shall be replaced with material approved by the Engineer at no

additional cost to the Owner. Service line tubing crossings under traveled roadways shall be installed as specified on the plans with a minimum cover of 30" below roadway surface.

2.3.1. Copper tubing for water service lines shall be type "K" and shall conform to ASTM Standard "Seamless Copper Water Tube" B 88, latest revision.

2.3.2. Polyvinyl chloride casing for water service lines shall be Schedule 40 PVC and shall conform to ASTM Standard "Polyvinyl Chloride (PVC) Plastic Pipe" D 1785, latest revision.

3. **PIPE LAYING**. All water mains shall be installed as specified in plans with a minimum cover of 36 inches from the top of pipe to an established subgrade. Where pipe is installed beneath railroad tracks, there shall be a minimum vertical distance of 4 feet-0 inches from the top of pipe to top of railroad ties. Construction clearance to cross under railroad trackage will be obtained from Railroad Authority by Owner. Any expense of bracing or supports to tracks during excavation operation beneath trackage shall be considered part of the contract. Where pipe is installed beneath State Highways, there shall be a minimum vertical distance of 4 feet from top of pipe to top of paving at center line of highway, or 2 feet from top of pipe to bottom of ditch (if existing), whichever is greater. In special locations, Highway Department may require additional cover. Construction clearance and other requirements to cross under State Highways shall be obtained by the appropriate jurisdictional agencies. Contractor shall confirm that all permits have been secured prior to beginning any work in State Rights-of-Way.

3.1. **Procedure**. After the trench is excavated to subgrade as specified, it shall be filled to grade as specified in the "Bedding & Backfill" section of these specifications. This material shall provide a smooth and uniform pipe bed for the entire length of the water pipe barrel. Trenching and pipe laying shall be uniformly in a straight line and to uniform elevation unless otherwise specified on plans. Pipe, fittings and valves shall be carefully handled to avoid damage. Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During layout operation, no debris, tolls, clothing or other material shall be placed into the pipe. After placing a length of pipe in the trench, the spigot end shall be centered in the bell, the pipe forced home, brought to the correct alignment and covered with an approved backfill material. Metallic tape shall be buried above pipe at a depth of 24 inches below finished grade for location purposes. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water tight plug or other approved means. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

4. **PIPE JOINTING**. In laying the water pipe to line and grade, the pipe shall be jointed in accordance with one of the following approved jointing methods. Owner reserves the right, before construction or while construction is in progress, to change the type of joints if its Engineer so directs, with the corresponding approval of the appropriate agency or agencies.

4.1. **Asbestos Cement Pipe Jointing**. Where tying into an existing Asbestos Cement Pipe, the contractor shall follow procedures in accordance with AWWA Standard "Installation of Asbestos Cement Pressure Pipe" C603-78, latest revision, where applicable. Where needed in replacing existing A.C. pipe at tie-ins, the machined ends of the pipe to be jointed,

coupling grooves and rubber rings shall be cleaned immediately before assembly. Care should be taken not to roll, pinch or reverse the gasket when placed in the bell. Each pipe joint shall be sealed with a coupling consisting of an asbestos cement sleeve and two rubber rings or an equivalent coupling or joint of equivalent strength and performance, as determined by Engineer.

4.2. **Polyvinyl Chloride (PVC) Pipe Jointing**. The contractor shall make certain before jointing polyvinyl chloride pipe that the ring groove in the bell of the pipe is clean, with no dirt or foreign material that could interfere with proper seating of the ring. Make sure pipe end is clean. Wipe with a clean dry cloth around the entire circumference from the end to one inch beyond the reference mark. Lubricate the spigot end of the pipe, using only the lubricant supplied by the manufacturer. Be sure the entire circumference is covered. The coating should be the equivalent of a brush coat of enamel paint. It can be applied by hand. cloth, pad, sponge or glove. Do not lubricate the ring groove in the bell because such lubrication could cause ring displacement. The level end is then inserted into the bell so that it is in contact with the ring. Brace the bell, while the level end is pushed in under the ring, so that previously completed joints in the line will not be closed up. The spigot end is pushed until the reference mark on the spigot end is flush with the end of the bell. If undue resistance to inserting of the level end is encountered or the reference mark does not reach the flush position, disassemble the joint and check the position of the ring. If it is twisted or pushed out of its seat, clean the ring, bell and level end and repeat the assembly steps.

5. **WET CONNECTIONS**. Schedules of existing fittings and proposed new fittings needed to make wet connections to existing waterlines as shown on the plans are estimates only. It is to be recognized that after existing lines and fittings are uncovered that some discrepancies may occur. Where discrepancies occur, the contractor shall request a decision by the Engineer as to how the connection in question shall be made. Contractor shall plan his work concerning wet connections in such a way that a minimum of inconvenience shall occur to existing water customers due to water service interruptions. Before water service interruptions are made to any customer, contractor shall notify designated official and cooperate with operating personnel en every way to minimize service interruptions due to wet conditions. In certain locations other utility lines or conduit may be obstructing the normal path of proposed waterlines. In such instances, gravity lines of any type hold priority as to grade over water pressure line, gas lines, electric conduits, or other obstruction conduits or combinations of conduits which may be encountered. Contractor is to analyze conditions carefully and then use best judgment in determining proper method of proceeding through obstructed area with waterline construction, and shall notify the Engineer forty-eight (48) hours in advance of making such connection after obtaining approval from the Engineer.

6. **APPURTENANCES**. Appurtenances to the waterline shall be provided and laid in accordance with the drawings and in the manner as specified herein.

6.1. Valves. Valves shall be installed at the locations indicated on, and with concrete thrust blocks as specified in the construction drawings, shall be wrapped in polyethylene as described in 2.2., and shall conform to the following requirements:

6.1.1. Gate valves shall conform to AWWA Standard “Resilient Seated Gate Valves, 3 inch through 12 inch” C509, latest revision, and shall be utilized for lines 12 inch and smaller, unless otherwise specified in the construction drawings. All gate valves shall be

iron body, bronze mounted, double disc parallel seats, non rising stem, internal wedging type. Valves must embody the best workmanship and finish, and open and close freely and easily. In closing, the gates must move without friction to their position opposite their ports, both disc being then closed squarely against the seat rings. When valves are in full open position, the discs shall be raised to clear the waterway and provide an opening equal to the full nominal diameter of the valves. All gate valves shall open by turning hand wheel or square nut operator counterclockwise. Hydrostatic and leakage test shall conform to AWWA Standard "Resilient Seated Gate Valves, 3 inch through 12 inch" C509-80, latest revision. Only Mechanical Joint Valves shall be used.

6.1.2. Butterfly valves shall conform to AWWA Standard "Rubber Seated Butterfly Valves" C504, latest revision; and shall be Class 150B, long body flanged, and shall be utilized for lines 16 inch and larger, unless otherwise specified in the construction drawings. Valves shall be provided with manual operators with enclosed in a grease-packed gear case. Work gears shall be bronze and worm gears shall be hardened steel. Manual operators shall be furnished with devices (Externally mounted) to hold the valve in a fixed position for an extended period of time and to indicate valve position. All butterfly valves shall open by turning hand wheel or square nut operator counterclockwise. Hydrostatic and leakage test shall conform to AWWA Standard "Rubber-Seated Butterfly Valves" C504, latest revision.

6.2. **Fire Hydrants**. Unless otherwise specified, fire hydrants shall conform to AWWA Standard "Dry-Barrel Fire Hydrants" C502, latest revision. Hydrants shall be cast iron, fully bronze mounted and have a working pressure of 150 psi. Fire hydrants shall have a minimum valve opening of 5 1/4 inch. All fire hydrants shall be located as shown on the plans, and in a manner to provide complete accessibility, and to minimize the possibility of damage from vehicles or injury to pedestrians. All hydrants shall stand plumb with the pumper nozzle facing the curb and the bury line of the hydrant at the finished grade. The barrel of the fire hydrant shall be set so that no portion of the pumper nozzle or hose nozzle will be less than 12 inches from the curb, walkway, or bike path or more than 20 feet from the face of the curb. The preferred location for the fire hydrant shall be 2 feet clear of the right-of-way line. All fire hydrants shall be placed in accordance with Port requirements. Fire hydrants installed near State Highways shall be in accordance with Texas Department of Transportation requirements. All fire hydrants shall be connected to the main in the manner shown on the Water Connection Standards. The connection of the Fire Hydrant to the 6" PVC pipe lead shall be Mechanical Joint. No push-on joints shall be used.

7. **TESTING**. All newly laid sections of pipe shall be hydrostatically tested at a gauge pressure of 150 psi. Contractor has the option of running hydrostatic test before or after trench has been completely backfilled. Trenches must be at least partially backfilled before hydrostatic testing to prevent pipe shift. Hydrostatic test shall be in accordance with AWWA Standard C600 Section 4 "Hydrostatic Testing" latest revision.

7.1. **Hydrostatic Test Procedure**. The contractor shall provide all necessary equipment and shall perform all work required in connection with the test. All pressure pipe, fittings and valves shall be subjected to a hydrostatic pressure of 150 psi. Air pressure testing will not be allowed. The line under test shall be slowly filled with water to the specified test pressure. The lowest elevation point of the section being tested shall be determined and any corrections necessary shall be corrected to the elevation of the test gauge by means of a hand pump, gasoline or electrically driven test pump connected to the pipe. A blow off or fire hydrant shall

be installed at the end of the line under test. Before applying the specified test pressure, all air shall be expelled from the test section including service connections. If hydrants or blow-offs are not available at high places, taps at points of highest elevation shall be made before the test is made and brass plugs inserted after the test has been completed. The required test pressure shall be applied for not less than two (2) hours and longer if ordered by the Owner. Hydrostatic test must be performed in presence of the Owner and pressure maintained until final approval of the test is given by Owner. Leakage test shall be conducted concurrently with pressure tests. Owner will inspect all pipe, fittings, valves and joints under tests. Any faults found to be due to improper workmanship shall be corrected by the contractor at no expense to Owner.

8. **STERILIZATION**. Pipeline construction shall be in accordance with Section 4 of AWWA Standard C601-01, latest revision. Upon or during completion of the hydrostatic test, the new section of pipe shall be sterilized in accordance with AWWA Standard "Disinfecting Water Mains" C601, latest revision; and the State of Texas Health Standards. Chlorine may be applied by the following methods: Continuous Feed Method and Chlorine Tablet Method. Contractor shall provide all equipment and chemicals necessary for sterilization.

8.1. **Continuous Feed Method**. This method is suitable for general application. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/l available chlorine. During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main to be tested is filled with the chlorine solution. The chlorine water shall be retained in the main for at least 24 hours during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24 hour period, the treated water shall contain no less than 24 mg/l chlorine throughout the length of the main.

8.2. **Chlorine Tablet Method**. Tablet disinfection is best suited to short extensions (up to 2,500 feet) and smaller diameter mains (up to 12 inches). Because the preliminary flushing step must be eliminated, this method shall be used only when scrupulous cleanliness has been exercised. It shall not be used if trench water or foreign material has entered the main or if the water is below 5 deg. C (41 deg. F). Calcium hypochlorite tablets are placed in each section of pipe and also in hydrants, hydrant branches and other appurtenances. They shall be attached by an adhesive, except for the tablets placed in hydrants and in the joints between the pipe sections. All the tablets within the main must be at the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position should be marked on the section to assure that there will be no rotation. In placing tablets in joints, they are either crushed and placed on the inside annular space or, if the type of assembly does not permit, they are rubbed like chalk on the butt ends of the sections to coat them with calcium hypochlorite. The adhesive may be Permatex No. 1 or any alternative approved by the Engineer of the purchaser. There shall be no adhesive on the tablet except on the broad side next to the surface to which the tablet is attached. If desired, the calcium hypochlorite may be placed in the pipe in granular form at a rate of one (1) cup (4 fl. oz.) per each pipe joint. When installation has been completed, the main shall be filled with water at a velocity lf less than 1-ft./sec. This water shall remain in the pipe for at least 24 hours. Valves shall be

manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.

8.3. **Final Flushing**. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/1. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

8.4. **Bacteriologic Tests**. After final flushing, and before the water main is placed in service, a sample or samples shall collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency or samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies when a chlorine residual is maintained throughout the new main. From un-chlorinated supplies at least two samples shall be collected at least 24 hours apart. In the case of extremely long mains, it is desirable that samples be collected the length of the line as well as at its end. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulfate. No hose or fire hydrant shall be used in collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected the gooseneck assembly may be removed and retained for future use.

8.5. **Repetition of Procedure**. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The tablet method cannot be used in these subsequent disinfections. when the samples are satisfactory, the main may be places in service.

9. **MEASUREMENT** Work under Water Line Pipework shall be measured as follows:

9.1. **Water Pipe**. Water Pipe shall be measured by the linear foot of each diameter of pipe installed.

9.2. **Appurtenances**. Water Line appurtenances, such as tapping sleeves, tapping valves, tees, gate valves, fire hydrants, plugs, etc., shall be measured by each unit installed.

10. **PAYMENT** Work under Water Line Pipework shall be paid as follows:

10.1. **Water Pipe**. Water Pipe shall be paid by the linear foot of each diameter of pipe installed of each size indicated in the Bid Proposal and in the Construction Drawings. The price bid shall include furnishing of the pipe, detection tape, and sand or other bedding materials, trenching, trench draining when required, compacting of bedding and backfill, replacing of existing road surfacing to prior condition or better, clean-up, and any necessary work and materials to successfully complete the installation of the pipe. Any work not included in the Bid Proposal shall be subsidiary to this pay item, and shall not be paid for separately.

10.2. **Appurtenances**. Other Sanitary Sewer appurtenances, such as tapping sleeves, tapping valves, tees, gate valves, fire hydrants, plugs, etc., shall be paid for by each unit installed. The price bid shall include furnishing of the appurtenance, concrete, tie-rods, and

all necessary materials to successfully install the appurtenance as required in the specifications, and as detailed in the Construction Drawings. Any work related to these appurtenances not included in the Bid Proposal shall be subsidiary to the corresponding pay item, and shall not be paid for separately.

TriAx TX5 General Specifications

2023 OSTOS ROAD PAVEMENT REHABILITATION

General

1. The Geogrid shall be integrally formed and produced from a punched sheet of polypropylene which is then oriented in three substantially equilateral directions so that the resulting ribs shall have a high degree of molecular orientation, which continues at least in part through the mass of the integral node.
2. The resulting Geogrid structure shall have apertures that are triangular in shape, and have ribs with depth-to-width ratios greater than 1.0.
3. The Geogrid shall have the typical characteristics shown in the table below:

Geometrical Properties – Triaxial Fabric (Base Bid)

Properties	Longitudinal	Diagonal	Transverse	General
• Rib pitch nominal dimension, mm (in)	40 (1.60)	40 (1.60)	-	
• Mid-rib depth nominal dimension, mm (in)	-	1.4 (0.06)	1.2 (0.05)	
• Mid-rib width nominal dimension, mm (in)	-	1.0 (0.04)	1.1 (0.04)	
• Rib shape				rectangular
• Aperture shape				triangular

Dimensions and Delivery

The Geogrid Fabric shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 4.0 meters (13.1feet) in width and 75 meters (246 feet) in length.

Notes

1. Nominal dimensions.
2. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
3. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355-05.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SCOPE**. This section shall cover the removal and disposal of all materials, in open cut and tunnel excavations, and in paving operations, necessary for performing the work as shown on the drawings or called for in the proposal or special provisions, including sheeting and bracing, drainage, and other work incidental to the preparation of the site for subsequent construction work.

2. **PREPARATION OF THE SITE**. Prior to commencing constructions operations, the contractor shall make all the provisions necessary to assure the protection shrubs, planting and grass areas and shall make provisions for maintaining public travel in an acceptable manner.

3. **PROTECTION OF EXISTING IMPROVEMENTS**. Before any excavation is started, adequate protection shall be provided for all lawns, trees, shrubs, landscape work, fences, sidewalks, hydrants, utility poles, street, alley and driveway paving, curbs, storm sewers, ditches, headwalls, catch basins, surface inlets and all other improvements that are to remain in place. Such protection shall be provided as long as necessary to prevent damage from the contractor's operations. Shrubs, bushes, small trees and flowers, which have to be removed to permit excavation for the waterline, shall be protected and replanted or replaced when the backfill is completed. The contractor shall be protected and replanted or replaced when the backfill is completed. The contractor shall exercise every precaution to prevent damage to property within and outside easements. He shall remove all debris and rock from the site and restore the ground surfaces to the original grade after proper compaction, replace or repair all driveways, buildings, fences, retaining walls, culverts, drains, paving, sidewalks, etc. which are removed or damaged during construction. Repair, restoration or replacements of any improvements damaged or removed shall be the obligation of the contractor at no additional cost to Owner.

4. **PERMITS**. The Contractor, or where and when required, the Owner, will obtain any necessary permits for water or wastewater improvements in public and private rights-of-way from pertinent jurisdictional authorities, as required.

5. **DRAINAGE**. The contractor shall make provisions for handling all flows in existing creeks, ditches, sewers, and trenches by pipes, flumes or other approved methods at all times when his operations would, in anyway, interfere with the natural functioning of said creeks, ditches, sewers and drains. The contractor shall at all times during construction provide and maintain sufficient equipment for the disposal of all water which enters the excavation, both in open cut trenches and in tunnels, to render such excavations firm and dry, until structures to be built thereon are completed.

5.1. **Methods**. Methods. Pipe under-drains, well point systems, deep well pumps or other suitable equipment and methods shall be used to keep all excavations firm and dry, at no additional cost to Owner unless otherwise provided in the proposal.

6. **EXCAVATED MATERIALS**. Materials of excavation shall be classified as earth excavation or as rock excavation and shall include whatever materials are encountered to the depth shown on the drawings, or as directed by the engineer.

6.1. **Disposal of Unsuitable Materials**. Excavated materials which are either surplus and not required or are unsuitable for backfilling shall be removed from the site of operations as soon as excavated. All excavated materials so removed shall be disposed of, at no additional cost to Owner at a location to be jointly determined by the Contractor and the Engineer.

6.2. **Storage of Suitable Materials**. Excavated materials suitable and required for backfill shall be stored in neat piles adjacent to the excavation in a manner so as to minimize interference with traffic, but shall not be placed at such heights above, or closeness to, the sidewalls of the excavations to endanger such operations due to slides or cave-ins.

7. **OPEN CUT EXCAVATION**. Open Cut excavation, in earth or other material, shall be safely supported and of sufficient width and depth to provide adequate room for the construction or installation of the work to the lines, grades and dimensions called for on the construction drawings.

7.1. **Trench Preparation**. The trench shall be dug so that the pipe can be laid to the alignment and depth required. It shall be excavated only so far in advance of pipe laying as authorized by the engineer. Unless otherwise ordered by the Owner, all trenches shall be excavated to a width not less than the external diameter of the pipe plus twelve inches (12"). The Contractor shall do all excavation of whatever substances encounter to depths specified. The trench shall be excavated to the depth requires so as to provide for the installation of the pipe bedding material to the depth specified on the drawings and elsewhere in these specifications. Bell holes shall be provided at each joint to permit jointing to be properly made and inspected.

7.2. **Unauthorized Excavation**. Excavation shall not be carried below the required level. Excess excavation below the required level shall be backfill at Contractor's expense with earth, sand or gravel as directed by Owner and shall be compacted to a minimum 95% Standard Proctor density.

7.3. **Earth Excavation**. Earth materials shall be excavated so that the open cut trenches conform with the lines, grades and dimensions shown and/or specified on the drawings.

7.3.1. When the bottom of the excavation is unsuitable as a foundation, it shall be excavated below subgrade and then filled with gravel which shall be mechanically compacted in 6" (six inch) layers to a minimum density of 95% Standard Proctor. Owner or Engineer will determine depth of removal and replacement of unstable soil. Contractor shall furnish pumps or well points to keep excavation free of water and also any necessary sheeting, shoring or bracing in conformance with Section 11 of these Standard Specifications to prevent cave-ins. Basis of payment shall be as indicated in the above mentioned specification.

7.3.2. Excavated earth materials may be used for backfill in conformance with the provisions of Section 6 of these Standard Specifications, subject to the approval of the Engineer.

8. **BORING AND JACKING**. Construction of water or sewer lines by boring and jacking methods will be required as specified in the plans and specifications. In the event line and grade cannot be obtained by boring and jacking, the Contractor will be required, at his expense, to construct a lined mined tunnel in lieu of a tunnel by boring and jacking.

8.1. **Backstop**. The backstop shall be of sufficient strength and shall be positioned to support the thrust of the boring equipment without incurring any vertical or horizontal displacement during the boring operations.

8.2. **Guide Rails**. The guide rails for the boring equipment may be of either timber or steel. They shall be laid accurately to line and grade and maintained in this position until completion of the boring operations.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SAFETY POLICY**:

1.1. Each supervisor and/or foreman shall fully understand his degree of responsibility and authority.

1.2. Prior to beginning work employees shall be taught to recognize hazards and safety precautions they must take.

1.3. During construction, supervisors and/or foremen shall conduct inspections, investigate accidents and anticipate hazards. They will meet on-the-job employee safety training and education needs. They will also take precautions to guard against potential hazards. They will insist on worker compensation in safety matters.

2. **ON-SITE POLICIES**:

The following will be the Trench Safety System Plan to be followed by the Contractor on all applicable pipe trenches within this project.

2.1. Surface encumbrances. Trees, boulders, and other surface encumbrances that are located so as to create a hazard to employees shall be made safe or removed.

2.2. Underground Installations.

2.2.1. The estimated location of utility installations, such as sewer, telephone, fuel, electric, or waterlines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation, as far as practicable.

2.2.2. Utility companies shall be contracted and advised of proposed work prior to the start of actual excavation.

2.2.3. When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by acceptable means, such as probing with hand-held tool.

2.2.4. While the excavation is open, underground structures shall be removed, protected, or supported as necessary to safeguard employees.

2.3. Access and Egress. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are five feet or more in depth so as to require no more than 25 feet of lateral travel for employees. A negotiable slope may be used as a means of egress unless climactic conditions (rain, snow, ice) create a hazard to the worker. This ramp will be constructed by controlling the backfill of the pipe trench so that the resulting slope will not exceed 4:1 or have steps higher than eight inches (8").

2.4. Exposure to vehicular traffic. Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

2.5. Exposure to falling loads. No employees shall be permitted underneath loads handled by lifting or digging vehicles being loaded or unloaded to avoid being struck by any spillage or falling material. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped to provided adequate protection for the operator during loading and unloading operations.

2.6. Warning systems for mobile equipment. When mobile equipment is operated adjacent to an excavations, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavations.

2.7. Hazardous atmospheres. No hazardous atmospheres are expected. However, if the natural conditions do not provide adequate ventilation of the trench, mechanical blowers will be provided to prevent the concentration of hazardous or oxygen deficient atmospheres.

2.8. Protection against water accumulation.

2.8.1. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless these conditions have been anticipated, and adequate precautions have been taken to protect employees against the hazards posed by water accumulations. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect against cave-ins, water removal to control the level of accumulating water, and use of a safety harness and life-line.

2.8.2. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operation shall be monitored by a competent person to ensure proper operation.

2.8.3. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will be inspected by a competent person in compliance with items 2.8.1. and 2.8.2. above.

2.9. Stability of adjacent structures.

2.9.1. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

2.9.2. Excavation below the level of the base or footing of any foundation or retaining wall shall not be permitted except when:

2.9.2.1. A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

2.9.2.2. The excavation is in stable rock; or

2.9.2.3. A qualified person, a qualified engineer, or a person under the direction of a qualified engineer, determines, based on accepted engineering practice, that the structure is at such a distance from the excavation so as to be unaffected by the excavation activity; or

2.9.2.4. A qualified person, a qualified engineer or a person under the direction of a qualified engineer determines, based on accepted engineering practice, that such work will not pose a hazard to employees.

2.9.3. Sidewalks and pavements shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

2.10. Protection of employees in excavations.

2.10.1. Employees shall be protected from cave-ins in excavations by the installation or use of an adequate protective system which meets the requirements of the table on page 6. However, the installation or use of a protective system is not required when:

2.10.1.1. Excavations are made in stable rock; or

2.10.1.2. Excavations are less than five feet in depth and examination of the ground by a competent person provides no indication that a cave-in should be expected.

2.10.2. In addition to the protection against cave-ins required in paragraph 2.10.1., adequate protection shall be provided to protect employees against loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the excavation face to stop and contain falling material; or other means that provide equivalent protection.

2.10.3. Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least two feet (.61m) from the edge of excavations, or be the use of retaining devices that are sufficient to prevent material or equipment from falling or rolling into excavations, or by a combination of both, if necessary.

2.11. Inspections.

2.11.1. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the superintendent for evidence of a situations of failure of protective systems, hazardous atmospheres, or other hazardous conditions. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

2.11.2. Where the superintendent finds evidence of a situation that could result in possible cave-ins indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employees exposure can be reasonably anticipated.

2.12. Trenches will be completely backfilled at the end of each working day. No more than a 100 feet of trench shall be open at one time.

3. **SHORING PROVISIONS**:

Shoring will be provided in accordance with the MINIMUM REQUIREMENTS FOR TRENCH SHORING on page 6.

THUMB PENETRATION (ASTM D-2488).

Type "A" soils with an unconfined compressive strength of 1.5 TSF or greater can be readily intended by the thumb, however, they can be penetrated by the thumb only with great effort.

Type "B" soils have a compressive strength between 0.5 TSF and 1.5 TSF3

.

Type "C" soils with an unconfined compressive strength of 0.5 TSF or less can be easily penetrated several inches by the thumb and can be molded by light finger pressure.

The superintendent will be provided with a CL-700A pocket penetrometer to measure the soil strength, in addition to the thumb test.

4. **MEASUREMENT**. Work under Trench Safety System shall be measured by the linear foot of trench supported or sloped in accordance to this specification

5. **PAYMENT**. Work under Trench Safety System shall be paid for by the linear foot of trench supported or sloped in accordance to this specification. Bid price shall include furnishing of trench jacks or trench box and/or sloping of trenches, as appropriate and pertinent.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SCOPE**. This item shall consist of preparing the sub-grade, existing sub-base or existing base by pulverizing and compacting the existing material to the required density. This item applies to natural ground, embankment, or existing pavement structures, and shall be constructed as specified herein and in conformance with the typical sections, lines and grades as shown on the drawings, or as established by the Engineer.

2. **MATERIALS**.

2.1. The Contractor shall prepare the subgrade and, where appropriate, the base to receive the next layer in the pavement section, as shown in the construction drawings.

3. **EQUIPMENT**.

3.1. The machinery, tools and equipment necessary for proper prosecution of the work shall be on the project and approved by the Engineer prior to the beginning of construction operations. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

4. **CONSTRUCTION METHODS**.

4.1. **General**. It is the primary objective of this specification to secure a completed course of prepared subgrade or base material containing a homogeneous mix, free from loose or segregated areas, of uniform density and moisture content, well bound for its full specified depth and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of moisture, maintain the work and rework the courses as necessary to meet the above requirements.

4.1.1. The roadbeds shall be constructed and shaped to conform to the typical sections, lines and grades as shown on the plans or as established by the Engineer. The material shall be excavated to the secondary grade (proposed bottom of Subgrade Preparation) and removed or windrowed to expose the secondary grade. Any wet or unstable materials below the secondary grade shall be corrected, as directed by the Engineer, by scarifying and compacting, or other methods until satisfactory stability is obtained.

4.1.2. If the Contractor elects to use a cutting and pulverizing machine that will remove the sub-grade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. However, the Contractor shall be required to roll the sub-grade with a loaded water truck, or as directed by the Engineer, before using the pulverizing machine, and shall correct any soft areas that this rolling may reveal. This method will be permitted only where a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth

surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.

4.1.3. The material and lime shall be thoroughly mixed by approved road mixers or other approved equipment, and the mixing continued until, in the opinion of the Engineer, a homogeneous friable mixture of material and lime is obtained, such that when all non-slaking aggregates retained on the 3/4" sieve are removed, the remainder of the material shall meet the following requirements when tested from the roadway in the roadway condition by laboratory sieves:

Minimum passing 1-3/4" sieve	100%
Minimum passing 3/4" sieve	85%

The subgrade material layer shall be sprinkled during the spreading operation as directed by the Engineer to provide optimum moisture in the mixing.

4.1.4. Compaction. Compaction of the subgrade layer shall begin immediately after final milling unless approval is obtained from the Engineer. The material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction shall begin at the bottom and shall continue until the entire depth of subgrade material is uniformly compacted by the method of compaction hereinafter specified as the "Density Control" method as indicated on the plans.

If the total thickness of the subgrade material cannot be mixed in one operation, the previously mixed material shall be bladed to a windrow just beyond the area to be treated and the next layer prepared as specified above. The first layer of the subgrade material shall be compacted in such a manner that the subgrade material will not be mixed with the underlying material.

When the "Density Control" method of compaction is indicated on the plans the following provisions shall apply:

The course shall be sprinkled as required and compacted to the extent necessary to provide the density specified below as determined by the use of the compaction ratio method:

Description	Density (Standard Proctor)
For prepared sub-grade or existing sub-base that will receive subse-quent sub-base or base courses.	Not less than 95% except when otherwise shown on the plans. Optimum moisture tolerance: -1 (dry) to +3 (wet).
For Limestone Base material and Limestone Base that will receive surface courses.	Not less than 98% except when otherwise shown on the plans. Optimum moisture tolerance: -3 (dry) to +3 (wet).

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests as necessary will be made by the Engineer. If the material fails to meet the density requirements, it shall be

reworked as necessary to meet these requirements. Throughout this entire operation the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density and finish before the next course is placed or the work is accepted, it shall be reprocessed and refinished at the expense of the Contractor.

4.2. Finishing and Preparation for Surfacing. After the final layer or course of the Prepared Subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling as directed with a pneumatic tire or other suitable roller sufficiently light to prevent hair-line cracking. In case where prepared subgrade or sub-base set up sufficiently to prevent objectionable damage from traffic, such layers may be opened to construction and/or access traffic, and covered by other courses, the day following compaction, unless otherwise directed by the Engineer. If the plans provide for the prepared subgrade material to be sealed or covered by other courses of material, such seal or course shall be applied within 14 days after final compaction is completed, unless otherwise directed by the Engineer.

5. **MEASUREMENT**.

5.1. Preparation of Subgrade, existing sub-base, and existing base shall me measured by the square yard of “Prepared Subgrade”, from the limits of treatment as specified on the drawings, and as shown on the typical sections.

6. **PAYMENT**.

6.1. The work performed as prescribed by this item and measured as provided under “Measurement” will be paid for as part of the Lump Sum Base Bid amount, as indicated in the Bid Proposal, and shall not be paid for separately.

6.2. Subgrade Preparation of the depths specified in the drawings will be paid for as part of the Lump Sum Base Bid price, as indicated on the Bid Proposal. The Lump Sum Base Bid price shall include compensation for all correction of secondary sub-grade, for loosening, mixing, pulverizing, spreading, drying, water content of the subgrade material, shaping and maintaining, compacting to specified densities, for all tools, equipment, labor, and for all incidentals necessary to successfully and adequately complete the work.

2023 OSTOS ROAD PAVEMENT REHABILITATION

1. **SCOPE**. This section shall cover the furnishing, laying, jointing and testing of all sewer pipe, including sewer appurtenances, both in open cut and in tunnels, as shown on the drawings or as directed by the ENGINEER.

2. **MATERIALS**. The materials to be used in pipework shall be furnished by the contractor, as approved by the ENGINEER to meet the requirement of the work of this contract as specified herein.

2.1. **Gravity Sewer Pipe.** Gravity sewer pipe shall be of the type indicated on the drawings, or of any of the other classifications below, if written approval is secured from the ENGINEER. Any pipe found defective, not meeting the specifications, or improperly installed shall be rejected and so marked and shall be replaced by pipe approved by the ENGINEER at no additional cost to the OWNER.

2.1.1. Pipe and fittings shall be manufactured in conformance with the materials and methods described in ASTM Specification D3034. Joint seals shall be compression type rubber gaskets in compliance with the requirements of ASTM Specification D1869.

2.2. **Force Mains**. Pressure sewer pipe may be of any of the following classifications. Any pipe found defective, not meeting the specifications, or improperly installed shall be rejected and so marked and shall be replaced by pipe approved by the Engineer at no additional cost to Owner.

2.2.1. Polyvinyl chloride pipe for force mains shall conform to AWWA Standard "Polyvinyl Chloride (PVC) Pressure Pipe" C-900-75 Class 100 DR-25, latest revision. Fittings for polyvinyl chloride (PVC) pipe shall be "Compact Fittings" short body, tar coated (not cement lined). Transition gaskets shall also be included, unless otherwise noted on the contract bid document or drawings.

2.3. **Watertight Joint Materials**. The contractor must exert every reasonable effort to secure a watertight joint and prevent infiltration of ground water into or ex-filtration of sewage out of all pipe sewers and property service connections. To achieve this, joint material shall be made of the materials as specified herein, unless otherwise set forth in Special Provisions or Proposal. Any joint materials found to be defective or not meeting the specifications shall be rejected and replaced by approved joint materials at no additional cost to OWNER.

2.3.1. Water stop joints shall be Polyvinyl Chloride (PVC) or other similar approved joint materials. Gaskets shall be made of rubber; neoprene is not acceptable.

3. **SERVICE CONNECTIONS**. Property service connections shall be installed using Polyvinyl Chloride Pipe (PVC). The pipe shall be SDR-35 and shall be manufactured in accordance with ASTM D3034. The joints shall be compression type rubber gasket joints conforming to ASTM D1869. The location of all laterals and service lines shall be shown on the plans. Where not approved street grade has been established, the depth of the connection shall be based on the assumed future street grade or on the present street or ground surface, as determined by the ENGINEER. At times when pipe laying is not in process, the open ends of the

pipe shall be closed by a watertight plug or other approved means. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

4. **LAYING PROCEDURE**. After the trench is excavated to a subgrade as specified, it shall be filled to grade with a minimum 6 inch sand layer. This material shall be mechanically tamped to a density minimum of 90%. This material shall provide a smooth and uniform pipe bed for the entire length of the sewer pipe barrel. Ditching and pipe laying shall be uniformly in a straight line and to uniform elevations unless otherwise specified on the plans. Pipe and fittings shall be carefully handled to avoid damage. Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During layout operation, no debris, tools, clothing or other material shall be placed into the pipe. After placing a length of pipe into the trench, the spigot end shall be centered in the bell,l the pipe forced home, brought to the correct alignment and covered with an approved backfill material. When the pipe is installed, metallic tape shall be buried 1 foot above top of pipe for location purposes.

5. **PIPE JOINTING**. In laying the sewer pipe to line and grade, the pipe shall be jointed in accordance with one of the approved jointing methods. OWNER reserves the right, before construction or while construction is in progress, to change the type of joints if its ENGINEER so directs.

5.1. **Polyvinyl Chloride Pipe** (PVC) **Jointing**. The contractor shall make certain before jointing polyvinyl chloride pipe that the ring groove in the bell of the pipe is clean with no dirt or foreign material that could interfere with proper seating of the ring. Make sure pipe end is clean. wipe with a clean dry cloth around the entire circumference from the end to one (1) inch beyond the reference mark. Lubricate the spigot end of the pipe, using only the lubricant supplied by the manufacturer. Be sure the entire circumference is covered. The coating shall be the equivalent of a brush coat of enamel paint. It can be applied by hand, cloth, pad, sponge, or glove. Do not lubricate the rubber ring or the ring groove in the bell because such lubricant could cause ring displacement. The level end is then inserted into the bell so that it is in contact with the ring. Brace the bell, while the level end is pushed in under the ring, so that previously completed joints in the line will not be closed up. The spigot end is pushed until the reference mark on the spigot end is flush with the end of the bell. If undue resistance to insertion of the level end is encountered or the reference mark does not reach the flush position, disassemble the joint and check the position of the ring. If it is twisted or pushed out of its seat, clean the ring, bell and level end and repeat the assembly steps.

6. **APPURTENANCES**. Appurtenances to the sewer shall be provided and laid in accordance with the drawings and in the manner as specified herein. Appurtenances in addition to those required by the drawings or the proposal, as approved or directed by the ENGINEER, shall be paid for under the appropriate items of the proposal.

6.1. **Branches and Fittings**. Branches and fittings shall be provided and laid as and where directed. T-branches and Y-branches, placed in the sewer for property service connections, shall be located by the contractor, as directed by the ENGINEER, at such points in the sewer so as to result in the property service connection having the shortest length

possible between the sewer and property line or easement line, unless otherwise indicated on the drawings or directed by the ENGINEER.

6.2. **Stubs**. Stubs for future sewer pipe shall be installed as indicated by the drawings. If the specified length of the stub is exceeded, there will be no additional cost to OWNER unless the extra length is ordered by the ENGINEER. Existing sewer pipe stubs shall be removed as required, but only when directed by the ENGINEER.

6.3. **Stacks**. Stacks shall be constructed as and where directed. The height of the stack shall be as indicated on the drawings, set forth in the proposal, as determined by the ENGINEER. The stack shall be encased in concrete in accordance with the "Typical Sewer Details" drawings.

6.4. **Drop Inlets**. Drop inlets to the manhole shall be constructed as and where indicated by the drawings of either of the types shown on the "Typical Sewer Details" drawings, as directed by the ENGINEER.

6.5. **Clean-outs**. Clean-outs on all service laterals shall be installed at the location shown on the plans and in accordance with the Wastewater Construction Standards.

6.6. **Manholes**. Manholes shall be constructed of the type shown on the "Typical Sewer Details" drawings to the elevations shown on the plan- profile sheets, or as directed. The manholes specified shall be Glass Fiber-Reinforced Polyester Manholes for use in sanitary sewer applications. They shall be a one-piece unit of one class, fabricated in a composite laminate. Walls shall be of uniform thickness and shall be free from thin spots and voids. Exterior be of uniform thickness and shall be free from thin spots and voids. Exterior surface shall be free of ridges and sharp protrusions and reinforcement. Interior surface shall be free of ridges and sharp protrusions and reinforcement. Interior surface shall also be smooth and free of ridges so as to facilitate self-cleaning. The exterior surface shall be covered with graded sand to facilitate bonding to the concrete base pad, cement stabilized sand backfill and cement grout used to seal around all incoming lines. The main line over which the manhole cut- out will be set shall be fitted with a seal ring as manufactured by Johns-Manville Manufacturing or equal. The manholes shall conform to ASTM D3753-79, Standard Specifications for Glass Fiber-Reinforced Polyester Manholes and all noted applicable documents. Materials, method of manufactured and manufacturing requirements must all conform to the above mentioned specification. The manufacturer shall submit written certification that their product meets the requirements of ASTM D3753-79 with test results of specified manholes included.

6.7. **Stoppers and Bulkheads**. Open ends of pipes and branches smaller than 15 inches in diameter shall be sealed with stoppers, cemented into place in an acceptable manner using a rubber gasket between the stopper and socket. (See Section 5.1.). Openings 15 inches in diameter and larger shall be closed with brick bulkheads at least 4 inches thick or by other approved methods as authorized. All openings to the pipeline shall be satisfactory protected from the entrance of earth, water or other material. If a temporary bulkhead is constructed to prevent sewage from backing into the trench excavation or to prevent foreign material from entering the sewer from the new sewer trench, the contractor shall be responsible for reconstructing, repairing, or replacing those portions of the existing sewers removed or damaged by his operations. Existing bulkheads shall be removed as indicated by the drawings or set forth in the proposal, but no until directed by the ENGINEER.

6.8. **Plug Valves**. In-line plug valves shall be installed at the locations indicated on and of the type and size designated in the construction drawings. They shall be of the non-lubricated eccentric type, with cast iron construction and resilient faced plugs. Contractor shall obtain the approval of the ENGINEER prior to installation of any plug valves.

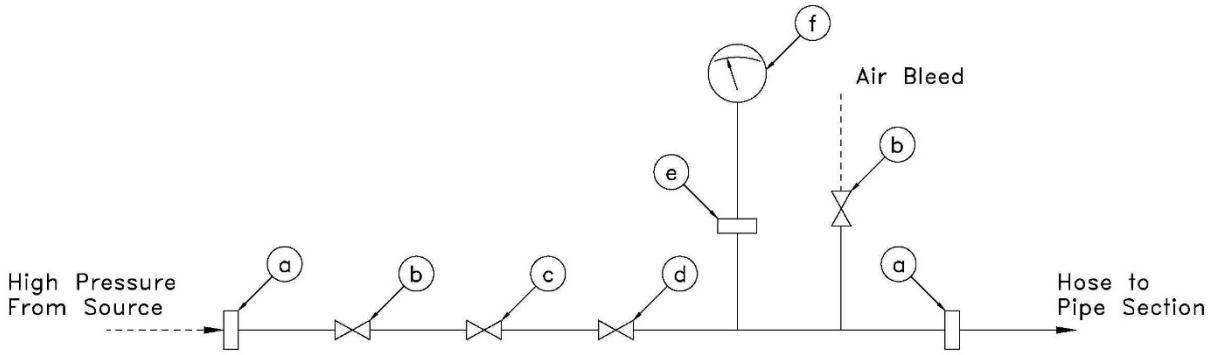
6.9. **Air Release Valves**. Air release valves shall be installed at the locations indicated on the construction drawings. They shall be of a design to release air and gases which accumulate at high points in sewer force mains, with backwash accessories. Air release valves shall be VAL-MATIC Model 48BWA or approved equal. OWNER approval for any air release valve shall be obtained prior to installation.

7. **LOW PRESSURE AIR TESTING**. This shall govern the testing of completed sections of installed gravity sewer pipe using low air pressure. The contractor shall assist in conducting low air pressure test on completed sections of gravity sewer mains. The air test results will be used to evaluate materials and construction methods on the pipe line sections, and successful air test shall be mandatory for the acceptance of the lines.

7.1. **Materials for Air Testing**. The following materials will be utilized for air testing gravity sewer mains:

7.1.1. Compressor Air Supply: Any source which will provide at least three hundred (300) cubic feet per minute at one hundred (100) pounds per square inch.

7.1.2. Plugs, valves, pressure gauges, air hose, connections, and other equipment necessary to conduct the air test shall be furnished by the Contractor. The test equipment for air testing will consist of valves, plugs, and pressure gauges used to control the rate at which air flows to the test section and to monitor the air pressure inside the plugs. Test equipment shall be assembled as follows:



a) Hose connection
b) Shut-off valve
c) Throttle valve
d) Pressure reduction valve
e) Gauge cock
f) Monitoring pressure gauge

7.2. Test Procedures. The following procedures will be utilized for air testing gravity sewer mains:

7.2.1. Determine section of line to be tested.

7.2.2. Apply air pressure until the pressure inside the pipe reaches 4 psig.

7.2.3. Allow the pressure inside the pipe to stabilize, then bleed back to 3.5 psig.

Table 1. Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size (in)	T (time) Min/100 ft.	Nominal Pipe Size (in)	T (time) Min/100 ft.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

7.2.4. At 3.5 psig, the time, temperature and pressure will be observed and recorded. A minimum of five (5) readings will be required for each test. If the time in minutes for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown on Table 1, the pipe shall be presumed free from defect. When these rates are exceeded, pipe breakage, joint leakage, or leaking plugs are indicated, and an inspection must be made to determine the cause. The Contractor shall effect such repairs as may be required to accomplish a successful air test.

8. **HYDROSTATIC TESTING**. This shall govern the testing of completed sections of installed pressure sewer pipe. The contractor shall conduct hydrostatic tests on completed sections of force mains.

8.1. **Materials for Hydrostatic Testing**. All materials and equipment for hydrostatic testing, such as pumps, hoses, valves, pressure gauges, water tanks, etc., shall be provided by the Contractor. The pump(s) utilized shall be capable of delivering 100 psi hydrostatic pressure.

8.2. **Test Procedure**. The Contractor shall perform all the necessary work required in connection with the tests. All pressure sewer pipe, fittings and valves shall be subjected to a hydrostatic pressure of 100 psi. Air testing will not be allowed. The line under test shall be filled with water and brought to the specified test pressure. Water shall be pumped from a reservoir such as a water truck, drum, lift station wet well, or the like, but shall not be fed into the force main directly from a waterline. All air shall be expelled from the section to be tested through the air release valve(s), if such are required on the construction drawings, and the shut-off gate(s) at the air release valves shall be closed before applying the specified test pressure to the line. Once the pressure is achieved, the delivering pump(s) shall be shut down, and the line shall maintain said pressure for no less that two (2) hours, and longer if ordered by the ENGINEER or the jurisdictional agency. These tests shall be performed in the presence of the project inspectors, and pressure maintained until final approval of the test is given by the Owner. The contractor shall effect such repairs as may be required to accomplish a successful hydrostatic test.

9. **LEAKAGE TESTS**. A leakage test may be requested by the ENGINEER at any time to determine whether or not there is excessive infiltration and to assure that the sewer section is substantially water-tight. The ENGINEER may order the Contractor to make leakage tests of as many sections as may be necessary to determine whether the work complies with the criteria for the rate of leakage. A section shall consist of a reach from one manhole to the next manhole provided the manholes are at least 300 feet apart, and preferably 400 feet. Leakage tests shall be conducted over a longer period of time with no reduction in the rate of leakage.

9.1. **Infiltration**. Leakage into the sewer including manholes, shall not exceed a rate of 250 gallons per 24 hours per inch diameter per mile of sewer. There shall be no gushing or spurting streams entering the sewer or manhole and where encountered, they shall be repaired regardless of the rate of infiltration and at no additional cost to the OWNER. Where practicable, the tests for leakage into the sewers shall be made at a time when the ground-water level is at a maximum, but it must be at least one foot (1') above the top of the pipe of the highest elevation in the section being tested.

9.2. **Ex-filtration**. Where the ground-water level is less than one foot (1') above t he top of the pipe and where conditions will permit, the sewers shall be subjected to an internal pressure by plugging the pipe at both ends and then filling the sewer and manholes with clean water to a height above the top of the pipe sufficient to obtain satisfactory measurements to determine the rate of leakage. The rate of leakage of the sewers may be determined by either the amount of subsidence in the water surface level or the amount of water required to maintain the original water surface level above the top of the pipe. Leakage from the sewers under test shall not exceed the requirement of leakage into sewers as specified in paragraph 9.1. of this section, except that an allowance of an additional 10 percent of gallonage shall be permitted for each additional 2 feet of head over a basic 2 foot minimum internal head.

9.3. **Requirements of the Contractor**. The Contractor shall construct such weirs or other means of measurements as may be required, shall furnish water, and shall do all necessary pumping to enable the tests to be properly made. When a leakage test fails, the Contractor shall do such other work as may be necessary until the rate of leakage meets the above requirements, as determined by additional leakage tests.

10. **DEFLECTION TESTS**. No sooner than 30 days, nor later than 12 months after a gravity sewer line has been installed and backfilling has been completed, tests for deflection shall be performed. A deflection of more than 5% of the inside diameter of the pipe shall be cause for rejection, and the line will be removed and replaced at the Contractor's expense. A GO NO-GO Deflection Testing Mandrel, to be furnished by the Contractor, and certified by the ENGINEER, shall be used. The testing shall consist of the following:

10.1. Completely flush the line, if required, making sure the pipe is clean of any mud or debris that would hinder the passage of the mandrel.

10.2. During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line.

10.3. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the rope.

10.4. Connect a retrieval rope to the back of the mandrel to pull it back if necessary.

10.5. Remove all slack in the pull rope and place a tape marker on the rope at the ends of the pipe where the mandrel will exit, determining the location of the mandrel in the line.

10.6. Using manhole guide pulleys, draw mandrel through the sewer line. If any irregularity of pipe deformation exceeding the allowable 5% is encountered in the line, the line shall be uncovered at that point.

10.7. If an obstructed or over-deflected section is found, locate it; dig down and uncover pipe; inspect the pipe; if any damaged pipe is found, replace it. If pipe is not damaged, re-round the pipe, replace and thoroughly tamp the embedment and initial backfill; replace remainder of backfill.

10.8. Re-test this entire section for deflection.

10.9. Any pipe removed shall be replaced by use of gasketed repair couplings. Each and every deflection test shall be conducted in the presence of representatives of either the OWNER or the ENGINEER.

11. **MEASUREMENT**. Work under Sanitary Sewer Pipework shall be measured as follows:

11.1. Sewer Pipe. Sanitary Sewer Pipe shall be measured by the linear foot of each diameter of pipe installed at two (2) foot depth intervals, with the first depth being zero to six feet (0'-6').

11.2. Fiberglass Manholes. Fiberglass Manholes shall be measured by each unit installed at two (2) foot depth intervals, with the first depth being zero to six feet (0'-6').

11.3. Appurtenances. Other Sanitary Sewer appurtenances, such as plugs, etc., shall be measured by each unit installed.

12. **PAYMENT**. Work under Sanitary Sewer Pipework shall be paid as follows

12.1. Sewer Pipe. Sanitary Sewer Pipe shall be paid by the linear foot of each diameter of pipe of installed at each size and depth indicated in the Bid Proposal and in the Construction Drawings. The price bid shall include furnishing of the pipe, detection tape, and sand or other bedding materials, trenching, trench draining when required, compacting of bedding and backfill, replacing of existing road surfacing to prior condition or better, clean-up, and any necessary work and materials to successfully complete the installation of the pipe. Any work not included in the Bid Proposal shall be subsidiary to this pay item, and shall not be paid for separately.

12.2. Fiberglass Manholes. Fiberglass Manholes shall be paid by each unit installed at the depth indicated on the Bid Proposal or in the Construction Drawings. The price bid shall include furnishing of the fiberglass manhole, concrete for the base, concrete adjustment rings, metallic ring and cover, trenching, trench draining when required, placing of concrete base and ring and cover, compacting, replacing of existing road surfacing to prior condition or better, clean-up, and any necessary work and materials to successfully complete the

installation of each manhole. Any related work not included in the Bid Proposal shall be subsidiary to this pay item, and shall not be paid for separately.

12.3. Appurtenances. Other Sanitary Sewer appurtenances, such as plugs, etc., shall be paid for by each unit installed. Any work related to these appurtenances not included in the Bid Proposal shall be subsidiary to the corresponding pay item, and shall not be paid for separately.

Item 110
Excavation

1. DESCRIPTION

Excavate areas as shown on the plans or as directed. Remove materials encountered to the lines, grades, and typical sections shown on the plans and cross-sections.

2. CONSTRUCTION

Accept ownership of unsuitable or excess material and dispose of material in accordance with local, state, and federal regulations at locations outside the right of way.

Maintain drainage in the excavated area to avoid damage to the roadway section. Correct any damage to the subgrade caused by weather at no additional cost to the Department.

Shape slopes to avoid loosening material below or outside the proposed grades. Remove and dispose of slides as directed.

2.1. **Rock Cuts**. Excavate to finish subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods," unless excavation is to clean homogenous rock at finish subgrade elevation. Use approved embankment material compacted in accordance with Section 132.3.4., "Compaction Methods," to replace undercut material at no additional cost if excavation extends below finish subgrade.

2.2. **Earth Cuts**. Excavate to finish subgrade. Scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation in areas where base or pavement structure will be placed on subgrade. Manipulate and compact subgrade in accordance with Section 132.3.4., "Compaction Methods."

Take corrective measures as directed if unsuitable material is encountered below subgrade elevations.

2.3. **Subgrade Tolerances**. Excavate to within 1/2 in. in cross-section and 1/2 in. in 16 ft. measured longitudinally for turnkey construction. Excavate to within 0.1 ft. in cross-section and 0.1 ft. in 16 ft. measured longitudinally for staged construction.

3. MEASUREMENT

This Item will be measured by the cubic yard in its original position as computed by the method of average end areas.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Limits of measurement for excavation in retaining wall areas will be as shown on the plans.

Shrinkage or swelling factors will not be considered in determining the calculated quantities.

4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Roadway)," "Excavation (Channel),"

"Excavation (Special)," or "Excavation (Roadway and Channel)." This price is full compensation for authorized excavation; drying; undercutting subgrade and reworking or replacing the undercut material in rock cuts; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

Drying required deeper than 6 in. below subgrade elevation will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Excavation and replacement of unsuitable material below subgrade elevations will be performed and paid for in accordance with the applicable bid items. However, if Item 132, "Embankment," is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When a slide not due to the Contractor's negligence or operation occurs, payments for removal and disposal of the slide material will be in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Excavation in backfill areas of retaining walls will not be measured or paid for directly but will be subsidiary to pertinent Items.

Item 132
Embankment

1. DESCRIPTION

Furnish, place, and compact materials for construction of roadways, embankments, levees, dikes, or any designated section of the roadway where additional material is required.

2. MATERIALS

Furnish approved material capable of forming a stable embankment from required excavation in the areas shown on the plans or from sources outside the right of way. Provide one or more of the following types as shown on the plans:

- **Type A**. Granular material that is free from vegetation or other objectionable material and meets the requirements of Table 1.

Table 1
Testing Requirements

Property	Test Method	Specification Limit
Liquid limit	Tex-104-E	≤ 45
Plasticity index (PI)	Tex-106-E	≤ 15
Bar linear shrinkage	Tex-107-E	≥ 2

Perform the Linear Shrinkage test only as indicated in Tex-104-E.

- **Type B**. Materials such as rock, loam, clay, or other approved materials.
- **Type C**. Material meeting the specification requirements shown on the plans. Type C may be further designated as Type C1, C2, etc.
- **Type D**. Material from required excavation areas shown on the plans.

Meet the requirements of the pertinent retaining wall Items for retaining wall backfill material.

3. CONSTRUCTION

Meet the requirements of Item 7, "Legal Relations and Responsibilities," when off right of way sources are used. Notify the Engineer before opening a material source to allow for required testing. Complete preparation of the right of way in accordance with Item 100, "Preparing Right of Way," for areas to receive embankment.

Backfill tree-stump holes or other minor excavations with approved material and tamp. Restore the ground surface, including any material disked loose or washed out, to its original slope. Compact the ground surface by sprinkling in accordance with Item 204, "Sprinkling," and by rolling using equipment complying with Item 210, "Rolling," when directed.

Scarify and loosen the unpaved surface areas, except rock, to a depth of at least 6 in. unless otherwise shown on the plans. Bench slopes before placing material. Begin placement of material at the toe of slopes. Do not place trees, stumps, roots, vegetation, or other objectionable material in the embankment. Simultaneously recompact scarified material with the placed embankment material. Do not exceed the layer depth specified in Section 132.3.4., "Compaction Methods."

Construct embankments to the grade and sections shown on the plans. Construct the embankment in layers approximately parallel to the finished grade for the full width of the individual roadway cross-sections unless

otherwise shown on the plans. Ensure that each section of the embankment conforms to the detailed sections or slopes. Maintain the finished section, density, and grade until the project is accepted.

3.1. **Earth Embankments**. Earth embankment is mainly composed of material other than rock. Construct embankments in successive layers, evenly distributing materials in lengths suited for sprinkling and rolling.

Treat material in accordance with Item 260, "Lime Treatment (Road-Mixed)" or Item 275, "Cement Treatment (Road-Mixed)" when required. Obtain approval to incorporate rock and broken concrete produced by the construction project in the lower layers of the embankment. Place the rock and concrete outside the limits of the completed roadbed when the size of approved rock or broken concrete exceeds the layer thickness requirements in Section 132.3.4., "Compaction Methods." Cut and remove all exposed reinforcing steel from the broken concrete.

Move the material dumped in piles or windrows by blading or by similar methods and incorporate it into uniform layers. Featheredge or mix abutting layers of dissimilar material for at least 100 ft. to ensure there are no abrupt changes in the material. Break down clods or lumps of material and mix embankment until a uniform material is attained.

Apply water free of industrial wastes and other objectionable matter to achieve the uniform moisture content specified for compaction.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact the layer to the required density in accordance with Section 132.3.4.2., "Density Control," when density control is specified.

3.2. **Rock Embankments**. Rock embankment is mainly composed of rock. Construct rock embankments in successive layers for the full width of the roadway cross-section with a depth of 18 in. or less. Increase the layer depth for large rock sizes as approved. Do not exceed a depth of 2-1/2 ft. in any case. Fill voids created by the large stone matrix with smaller stones during the placement and filling operations.

Ensure the depth of the embankment layer is greater than the maximum dimension of any rock. Do not place rock greater than 2 ft. in its maximum dimension, unless otherwise approved. Construct the final layer with graded material so that the density and uniformity is in accordance with Section 132.3.4., "Compaction Methods." Break up exposed oversized material as approved.

Roll and sprinkle each embankment layer in accordance with Section 132.3.4.1., "Ordinary Compaction," when ordinary compaction is specified. Compact each layer to the required density in accordance with Section 132.3.4.2., "Density Control," when density control is specified. Proof-roll each rock layer as directed, where density testing is not possible, in accordance with Item 216, "Proof Rolling," to ensure proper compaction.

3.3. **Embankments Adjacent to Culverts and Bridges**. Compact embankments adjacent to culverts and bridges in accordance with Item 400, "Excavation and Backfill for Structures."

3.4. **Compaction Methods**. Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller. Begin rolling at the lower side and progress toward the high side on super elevated curves. Alternate roller trips to attain slightly different lengths. Compact embankments in accordance with Section 132.4.1., "Ordinary Compaction," or Section 132.3.4.2., "Density Control," as shown on the plans.

3.4.1. **Ordinary Compaction**. Use approved rolling equipment complying with Item 210, "Rolling," to compact each layer. Use specific equipment when required by the plans or the Engineer. Do not allow the loose depth of any layer to exceed 8 in., unless otherwise approved. Bring each layer to the moisture content directed before and during rolling operations. Compact each layer until there is no evidence of further consolidation. Maintain a level layer to ensure uniform compaction. Recompact and refinish the subgrade at no additional expense to the Department if the required stability or finish is lost for any reason.

3.4.2. **Density Control**. Compact each layer to the required density using equipment complying with Item 210, "Rolling." Determine the maximum lift thickness based on the ability of the compacting operation and equipment to meet the required density. Do not exceed layer thickness of 16 in. loose or 12 in. compacted material unless otherwise approved. Maintain a level layer to ensure uniform compaction.

The Engineer will use Tex-114-E to determine the maximum dry density (D_a) and optimum moisture content (W_{opt}). Meet the requirements for field density and moisture content in Table 2 unless otherwise shown on the plans.

Table 2
Field Density Control Requirements

Description	Density	Moisture Content
	Tex-115-E	
PI ≤ 15	≥ 98% D_a	
15 < PI ≤ 35	≥ 98% D_a and ≤ 102% D_a	≥ $W_{opt.}$
PI > 35	≥ 95% D_a and ≤ 100% D_a	≥ $W_{opt.}$

Each layer is subject to testing by the Engineer for density and moisture content. During compaction, the moisture content of the soil should not exceed the value shown on the moisture-density curve, above optimum, required to achieve:

- 98% dry density for soils with a PI greater than 15 but less than or equal to 35 or
- 95% dry density for soils with PI greater than 35.

Remove small areas of the layer to allow for density tests as required. Replace the removed material and recompact at no additional expense to the Department. Proof-roll in accordance with Item 216, "Proof Rolling," when shown on the plans or as directed. Correct soft spots as directed.

3.5. **Maintenance of Moisture and Reworking**. Maintain the density and moisture content once all requirements in Table 2 are met. Maintain the moisture content no lower than 4% below optimum for soils with a PI greater than 15. Rework the material to obtain the specified compaction when the material loses the required stability, density, moisture, or finish. Alter the compaction methods and procedures on subsequent work to obtain specified density as directed.

3.6. **Acceptance Criteria**.

3.6.1. **Grade Tolerances**.

3.6.1.1. **Staged Construction**. Grade to within 0.1 ft. in the cross-section and 0.1 ft. in 16 ft. measured longitudinally.

3.6.1.2. **Turnkey Construction**. Grade to within 1/2 in. in the cross-section and 1/2 in. in 16 ft. measured longitudinally.

3.6.2. **Gradation Tolerances**. Ensure no more than 1 of the 5 most recent gradation tests is outside the specified limits on any individual sieve by more than 5% when gradation requirements are shown on the plans.

3.6.3. **Density Tolerances**. Ensure no more than 1 of the 5 most recent density tests for compaction work is outside the specified density limits, and no test is outside the limits by more than 3 pcf.

3.6.4. **Plasticity Tolerances**. Ensure no more than 1 of the 5 most recent PI tests for material is outside the specified limit by more than 2 points.

4. MEASUREMENT

Embankment will be measured by the cubic yard. Measurement will be further defined for payment as follows:

4.1. **Final**. The cubic yard will be measured in its final position using the average end area method. The volume is computed between the original ground surface or the surface upon which the embankment is to be constructed and the lines, grades, and slopes of the embankment. In areas of salvaged topsoil, payment for embankment will be made in accordance with Item 160, "Topsoil." Shrinkage or swell factors will not be considered in determining the calculated quantities.

4.2. **Original**. The cubic yard will be measured in its original and natural position using the average end area method.

4.3. **Vehicle**. The cubic yard will be measured in vehicles at the point of delivery.

When measured by the cubic yard in its final position, this is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Shrinkage or swell factors are the Contractor's responsibility. When shown on the plans, factors are for informational purposes only.

Measurement of retaining wall backfill in embankment areas is paid for as embankment unless otherwise shown on the plans. Limits of measurement for embankment in retaining wall areas are shown on the plans.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Embankment (Final)," "Embankment (Original)," or "Embankment (Vehicle)" of the compaction method and type specified. This price is full compensation for furnishing embankment; hauling; placing, compacting, finishing, and reworking; disposal of waste material; and equipment, labor, tools, and incidentals.

When proof rolling is directed, it will be paid for in accordance with Item 216, "Proof Rolling."

All sprinkling and rolling, except proof rolling, will not be paid for directly but will be considered subsidiary to this Item, unless otherwise shown on the plans.

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Item 160
Topsoil

1. DESCRIPTION

Furnish and place topsoil to the depths and on the areas shown on the plans.

2. MATERIALS

Use easily cultivated, fertile topsoil that is free from objectionable material and resists erosion. Obtain topsoil from the right of way at sites of proposed excavation or embankment when specified on the plans, or as directed. Secure additional topsoil, if necessary, from approved sources outside the right of way in accordance with the requirements of Article 7.7., "Preservation of Cultural and Natural Resources and the Environment." Ensure that the topsoil obtained from sites outside the right of way has a pH of 5.5 to 8.5, per Tex-128-E. Topsoil is subject to testing by the Engineer. Furnish water in accordance with Article 168.2., "Materials."

3. CONSTRUCTION

Remove and dispose of objectionable material from the topsoil source before beginning the work. Stockpile topsoil, when necessary, in a windrow at designated locations along the right of way line or as directed. Keep source and stockpile areas drained during the period of topsoil removal and leave them in a neat condition when removal is complete. Cultivate the area to a depth of 4 in. before placing topsoil. Spread the topsoil to a uniform loose cover at the thickness specified. Place and shape the topsoil as directed. Water and roll the topsoil with a light roller or other suitable equipment.

4. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard complete in place, or by the cubic yard in vehicles at the point of delivery.

5. PAYMENT

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Furnishing and Placing Topsoil" of the depth specified on the plans (except for measurement by the cubic yard). This price is full compensation for securing necessary sources and royalties; furnishing topsoil; excavation, loading, hauling, stockpiling and placing; watering; rolling; and equipment, labor, materials, tools, and incidentals. Limits of excavation and embankment for payment are shown in Figure 1.

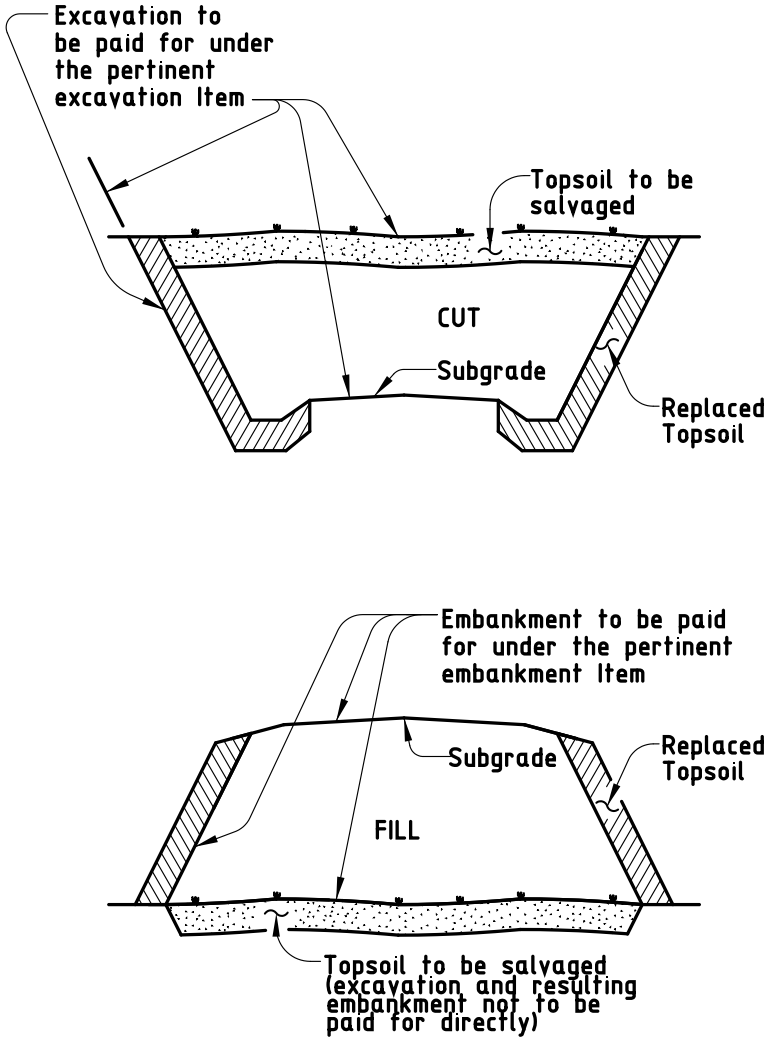


Figure 1
Roadway Cross-Sections Showing Payment for Excavation and Embankment

Item 164
Seeding for Erosion Control

1. DESCRIPTION

Provide and install temporary or permanent seeding for erosion control as shown on the plans or as directed.

2. MATERIALS

2.1. **Seed**. Provide seed from the previous season's crop meeting the requirements of the Texas Seed Law, including the testing and labeling for pure live seed (PLS = Purity × Germination). Furnish seed of the designated species, in labeled unopened bags or containers to the Engineer before planting. Use within 12 mo. from the date of the analysis. When Buffalograss is specified, use seed that is treated with KNO_3 (potassium nitrate) to overcome dormancy.

Use Tables 1–4 to determine the appropriate seed mix and rates as specified on the plans. If a plant species is not available by the producers, the other plant species in the recommended seed mixture will be increased proportionally by the PLS/acre of the missing plant species.

Table 1
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
1 (Paris) Feb. 1–May 15	Green Sprangletop Sideoats Grama (Haskell) Bermudagrass Little Bluestem (Native) Illinois Bundleflower	0.3 3.2 1.8 1.7 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Weeping Lovegrass (Ermelo) Partridge Pea	0.3 1.5 6.0 0.6 0.8 1.0
2 (Ft. Worth) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Purple Prairie Clover (Cuero) Engelmann Daisy (Eldorado) Illinois Bundleflower Awnless Bushsunflower (Plateau)	1.0 1.0 1.0 0.4 0.2 0.8 0.6 0.75 1.3 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Slender Grama (Dilley) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover	1.0 0.2 0.2 0.4 1.0 0.2 0.2 0.6 0.8 0.75 0.3
3 (Wichita Falls) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Blue Grama (Hachita) Western Wheatgrass (Barton) Galleta Grass (Viva) Engelmann Daisy (Eldorado) Awnless Bushsunflower (Plateau)	0.6 1.0 1.0 0.4 0.2 0.8 0.4 1.2 0.6 0.75 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover (Cuero)	1.0 0.2 0.2 0.4 0.2 0.2 0.6 0.8 0.75 0.3
4 (Amarillo) Feb. 15–May 15	Green Sprangletop Sideoats Grama (Haskell) Blue Grama (Hachita) Buffalograss (Texoka) Illinois Bundleflower	0.3 3.6 1.2 1.6 1.0	Green Sprangletop Weeping Lovegrass (Ermelo) Blue Grama (Hachita) Sand Dropseed (Borden Co.) Sand Bluestem Purple Prairie Clover	0.3 0.8 1.0 0.3 1.8 0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
5 (Lubbock) Feb. 15–May 15	Green Sprangletop Sideoats Grama (El Reno) Blue Grama (Hachita) Buffalograss (Texoka) Illinois Bundleflower	0.3 3.6 1.2 1.6 1.0	Green Sprangletop Weeping Lovegrass (Ermelo) Blue Grama (Hachita) Sand Dropseed (Borden Co.) Sand Bluestem Purple Prairie Clover	0.3 0.8 1.0 0.3 1.8 0.5
6 (Odessa) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Blue Grama (Hachita) Galleta Grass (Viva) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Alkali Sacaton (Saltalk) Plains Bristlegrass (Catarina Blend) False Rhodes Grass (Kinney) Whiplash Pappusgrass (Webb) Arizona Cottontop (La Salle)	1.0 1.0 0.4 0.6 0.2 0.6 0.2 0.2 0.1 0.6 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Blue Grama (Hachita) Hairy Grama (Chaparral) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Indian Ricegrass (Rim Rock) Sand Bluestem (Cottle County) Little Bluestem (Pastura) Purple Prairie Clover (Cuero)	1.0 0.2 0.4 0.4 0.2 0.2 1.6 1.2 0.8 0.3
7 (San Angelo) Feb. 1–May 1	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Blue Grama (Hachita) Western Wheatgrass (Barton) Galleta Grass (Viva) Engelmann Daisy (Eldorado) Illinois Bundleflower (Sabine)	1.0 1.0 1.0 0.4 0.2 0.4 0.4 1.2 0.6 0.75 1.0	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Sand Bluestem (Cottle County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover (Cuero)	1.0 0.2 0.2 0.4 0.2 0.2 1.2 0.6 0.8 0.75 0.3
8 (Abilene) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Blue Grama (Hachita) Western Wheatgrass (Barton) Galleta Grass (Viva) Engelmann Daisy (Eldorado) Illinois Bundleflower (Sabine)	1.0 1.0 1.0 0.4 0.2 0.4 0.4 1.2 0.6 0.75 1.0	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Sand Bluestem (Cottle County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover (Cuero)	1.0 0.2 0.2 0.4 0.2 0.2 1.2 0.6 0.8 0.75 0.3
9 (Waco) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Purple Prairie Clover (Cuero) Engelmann Daisy (Eldorado) Illinois Bundleflower Awnless Bushsunflower (Plateau)	1.0 1.0 1.0 0.4 0.2 0.8 0.6 0.75 1.3 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Slender Grama (Dilley) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover	1.0 0.2 0.2 0.4 1.0 0.2 0.2 0.6 0.8 0.75 0.3
10 (Tyler) Feb. 1–May 15	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sideoats Grama (Haskell) Illinois Bundleflower	0.3 1.8 9.0 2.7 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Weeping Lovegrass (Ermelo) Sand Lovegrass Lance-Leaf Coreopsis	0.3 1.8 9.0 0.5 0.5 1.0
11 (Lufkin) Feb. 1–May 15	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sideoats Grama (Haskell) Illinois Bundleflower	0.3 1.8 9.0 2.7 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Lance-Leaf Coreopsis	0.3 2.1 9.0 0.5 1.0

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
12 (Houston) Jan. 15–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Little Bluestem (Native) Illinois Bundleflower	0.3 2.1 3.2 1.4 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Weeping Lovegrass (Ermelo) Lance-Leaf Coreopsis	0.3 2.4 10.5 1.0 1.0
13 (Yoakum) Jan. 15–May 15	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Slender Grama (Dilley) Shortspike Windmillgrass (Welder) Halls Panicum (Oso) Plains Bristlegrass (Catarina Blend) Canada Wildrye (Lavaca) Illinois Bundleflower (Sabine) Purple Prairie Clover (Cuero)	1.0 1.0 1.5 1.0 0.3 0.2 0.2 2.0 1.3 0.6	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Slender Grama (Dilley) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Purple Prairie Clover (Cuero) Partridge Pea (Comanche) Englemann Daisy (Eldorado)	1.0 0.4 1.0 0.8 0.2 0.6 0.6 1.0
14 (Austin) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Purple Prairie Clover (Cuero) Engelmann Daisy (Eldorado) Illinois Bundleflower (Sabine) Awnless Bushsunflower (Plateau)	1.0 1.0 1.0 0.4 0.2 0.8 0.6 0.75 1.3 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Slender Grama (Dilley) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover	1.0 0.2 0.2 0.4 1.0 0.2 0.2 0.6 0.8 0.75 0.3
15 (San Antonio) Feb. 1–May 1	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Slender Grama (Dilley) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Halls Panicum (Oso) Plains Bristlegrass (Catarina Blend) False Rhodes Grass (Kinney) Hooded Windmillgrass (Mariah) Arizona Cottontop (La Salle)	1.0 1.0 1.0 1.0 0.2 0.6 0.2 0.2 0.1 0.2 0.2	Green Sprangletop (Van Horn) Slender Grama (Dilley) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Plains Bristlegrass (Catarina Blend) Hooded Windmillgrass (Mariah) Multi-flowered False Rhoades Grass (Hidalgo) Arizona Cottontop (La Salle)	1.0 2.0 0.6 0.4 0.6 0.2 0.3 0.1 0.2
16 (Corpus Christi) Jan. 1–May 1	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Slender Grama (Dilley) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Halls Panicum (Oso) Plains Bristlegrass (Catarina Blend) False Rhodes Grass (Kinney) Hooded Windmillgrass (Mariah) Arizona Cottontop (La Salle)	1.0 1.0 1.0 1.0 0.2 0.6 0.2 0.2 0.1 0.2 0.2	Green Sprangletop (Van Horn) Slender Grama (Dilley) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Plains Bristlegrass (Catarina Blend) Hooded Windmillgrass (Mariah) Multi-flowered False Rhodes Grass (Hidalgo) Arizona Cottontop (La Salle)	1.0 2.0 0.6 0.4 0.6 0.2 0.3 0.1 0.2
17 (Bryan) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Little Bluestem (Native) Illinois Bundleflower	0.3 1.5 3.6 1.7 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Weeping Lovegrass (Ermelo) Sand Lovegrass Lance-Leaf Coreopsis	0.3 1.5 7.5 0.6 0.6 1.0

Table 1 (continued)

Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
18 (Dallas) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Purple Prairie Clover (Cuero) Engelmann Daisy (Eldorado) Illinois Bundleflower Awnless Bushsunflower (Plateau)	1.0 1.0 1.0 0.4 0.2 0.8 0.6 0.75 1.3 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Slender Grama (Dilley) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover	1.0 0.2 0.2 0.4 1.0 0.2 0.2 0.6 0.8 0.75 0.3
19 (Atlanta) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Illinois Bundleflower	0.3 2.4 4.5 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Lance-Leaf Coreopsis	0.3 2.1 7.5 0.6 1.0
20 (Beaumont) Jan. 15–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Illinois Bundleflower	0.3 2.7 4.1 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Lance-Leaf Coreopsis	0.3 2.1 7.5 0.6 1.0
21 (Pharr) Jan. 15–May 15	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Slender Grama (Dilley) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Halls Panicum (Oso) Plains Bristlegrass (Catarina Blend) False Rhodes Grass (Kinney) Hooded Windmillgrass (Mariah) Arizona Cottontop (La Salle)	1.0 1.0 1.0 1.0 0.2 0.6 0.2 0.2 0.1 0.2 0.2	Green Sprangletop (Van Horn) Slender Grama (Dilley) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Plains Bristlegrass (Catarina Blend) Hooded Windmillgrass (Mariah) Multi-flowered False Rhoades Grass (Hidalgo) Arizona Cottontop (La Salle)	1.0 2.0 0.6 0.4 0.6 0.2 0.3 0.1 0.2
22 (Laredo) Jan. 15–May 1	Green Sprangletop (Van Horn) Sideoats Grama (South Texas) Texas Grama (Atascosa) Slender Grama (Dilley) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Halls Panicum (Oso) Plains Bristlegrass (Catarina Blend) False Rhodes Grass (Kinney) Hooded Windmillgrass (Mariah) Arizona Cottontop (La Salle)	1.0 1.0 1.0 1.0 0.2 0.6 0.2 0.2 0.1 0.2 0.2	Green Sprangletop (Van Horn) Slender Grama (Dilley) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Pink Pappusgrass (Maverick) Plains Bristlegrass (Catarina Blend) Hooded Windmillgrass (Mariah) Multi-flowered False Rhoades Grass (Hidalgo) Arizona Cottontop (La Salle)	1.0 2.0 0.6 0.4 0.6 0.2 0.3 0.1 0.2
23 (Brownwood) Feb. 1–May 15	Green Sprangletop (Van Horn) Sideoats Grama (Haskell) Texas Grama (Atascosa) Hairy Grama (Chaparral) Shortspike Windmillgrass (Welder) Little Bluestem (OK Select) Blue Grama (Hachita) Western Wheatgrass (Barton) Galleta Grass (Viva) Engelmann Daisy (Eldorado) Awnless Bushsunflower (Plateau)	0.6 1.0 1.0 0.4 0.2 0.8 0.4 1.2 0.6 0.75 0.2	Green Sprangletop (Van Horn) Hooded Windmillgrass (Mariah) Shortspike Windmillgrass (Welder) Hairy Grama (Chaparral) Sand Lovegrass (Mason) Sand Dropseed (Borden County) Partridge Pea (Comanche) Little Bluestem (OK Select) Englemann Daisy (Eldorado) Purple Prairie Clover (Cuero)	1.0 0.2 0.2 0.4 0.2 0.2 0.6 0.8 0.75 0.3

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
24 (El Paso)	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
Feb. 1–May 15	Sideoats Grama (South Texas)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Blue Grama (Hachita)	0.4	Blue Grama (Hachita)	0.4
	Galleta Grass (Viva)	0.6	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Sand Lovegrass (Mason)	0.2
	Pink Pappusgrass (Maverick)	0.6	Sand Dropseed (Borden County)	0.2
	Alkali Sacaton (Saltalk)	0.2	Indian Ricegrass (Rim Rock)	1.6
	Plains Bristlegrass (Catarina Blend)	0.2	Sand Bluestem (Cottle County)	1.2
	False Rhodes Grass (Kinney)	0.1	Little Bluestem (Pastura)	0.8
	Whiplash Pappusgrass (Webb)	0.6	Purple Prairie Clover (Cuero)	0.3
	Arizona Cottontop (La Salle)	0.2		
25 (Childress)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Sideoats Grama (El Reno)	2.7	Weeping Lovegrass (Ermelo)	1.2
	Blue Grama (Hachita)	0.9	Sand Dropseed (Borden Co.)	0.5
	Western Wheatgrass	2.1	Sand Lovegrass	0.8
	Galleta	1.6	Purple Prairie Clover	0.5
	Illinois Bundleflower	1.0		

Table 2
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
1 (Paris)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
2 (Ft. Worth)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	3.6
	Bermudagrass	2.4	Bermudagrass	2.1
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.3
3 (Wichita Falls)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Sideoats Grama (El Reno)	4.5	Sideoats Grama (El Reno)	3.6
	Bermudagrass	1.8	Bermudagrass	1.8
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.4
4 (Amarillo)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 15–May 15	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.4
			Buffalograss (Texoka)	1.6
5 (Lubbock)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 15–May 15	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.4
			Buffalograss (Texoka)	1.6
6 (Odessa)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Sideoats Grama (Haskell)	3.6	Sideoats Grama (Haskell)	2.7
	Blue Grama (Hachita)	1.2	Sand Dropseed (Borden Co.)	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6
7 (San Angelo)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 1	Sideoats Grama (Haskell)	7.2	Sideoats Grama (Haskell)	3.2
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.3
			Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6
8 (Abilene)	Green Sprangletop	0.3	Green Sprangletop	0.3
Feb. 1–May 15	Sideoats Grama (Haskell)	3.6	Sand Dropseed (Borden Co.)	0.3
	Blue Grama (Hachita)	1.2	Sideoats Grama (Haskell)	3.6
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.8
			Buffalograss (Texoka)	1.6

Table 2 (continued)
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/acre)		Sandy Soils Species and Rates (lb. PLS/acre)	
9 (Waco) Feb. 1–May 15	Green Sprangletop Bermudagrass Buffalograss (Texoka) Sideoats Grama (Haskell)	0.3 1.8 1.6 4.5	Green Sprangletop Buffalograss (Texoka) Bermudagrass Sand Dropseed (Borden Co.)	0.3 1.6 3.6 0.4
10 (Tyler) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell)	0.3 2.4 4.5	Green Sprangletop Bermudagrass	0.3 5.4
11 (Lufkin) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell)	0.3 2.4 4.5	Green Sprangletop Bermudagrass	0.3 5.4
12 (Houston) Jan. 15–May 15	Green Sprangletop Sideoats Grama (Haskell) Bermudagrass	0.3 4.5 2.4	Green Sprangletop Bermudagrass	0.3 5.4
13 (Yoakum) Jan. 15–May 15	Green Sprangletop Sideoats Grama (South Texas) Bermudagrass	0.3 4.5 2.4	Green Sprangletop Bermudagrass	0.3 5.4
14 (Austin) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (South Texas) Buffalograss (Texoka)	0.3 2.4 3.6 1.6	Green Sprangletop Bermudagrass Buffalograss (Texoka)	0.3 4.8 1.6
15 (San Antonio) Feb. 1–May 1	Green Sprangletop Sideoats Grama (South Texas) Bermudagrass Buffalograss (Texoka)	0.3 3.6 2.4 1.6	Green Sprangletop Bermudagrass Buffalograss (Texoka)	0.3 4.8 1.6
16 (Corpus Christi) Jan. 1–May 1	Green Sprangletop Sideoats Grama (South Texas) Bermudagrass Buffalograss (Texoka)	0.3 3.6 2.4 1.6	Green Sprangletop Bermudagrass Buffalograss (Texoka)	0.3 4.8 1.6
17 (Bryan) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell)	0.3 2.4 4.5	Green Sprangletop Bermudagrass	0.3 5.4
18 (Dallas) Feb. 1–May 15	Green Sprangletop Sideoats Grama (El Reno) Buffalograss (Texoka) Bermudagrass	0.3 3.6 1.6 2.4	Green Sprangletop Buffalograss (Texoka) Bermudagrass Sand Dropseed (Borden Co.)	0.3 1.6 3.6 0.4
19 (Atlanta) Feb. 1–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell)	0.3 2.4 4.5	Green Sprangletop Bermudagrass	0.3 5.4
20 (Beaumont) Jan. 15–May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell)	0.3 2.4 4.5	Green Sprangletop Bermudagrass	0.3 5.4
21 (Pharr) Jan. 15–May 15	Green Sprangletop Sideoats Grama (South Texas) Buffalograss (Texoka) Bermudagrass	0.3 3.6 1.6 2.4	Green Sprangletop Buffalograss (Texoka) Bermudagrass Sand Dropseed (Borden Co.)	0.3 1.6 3.6 0.4
22 (Laredo) Jan. 15–May 1	Green Sprangletop Sideoats Grama (South Texas) Buffalograss (Texoka) Bermudagrass	0.3 4.5 1.6 1.8	Green Sprangletop Buffalograss (Texoka) Bermudagrass Sand Dropseed	0.3 1.6 3.6 0.4
23 (Brownwood) Feb. 1–May 15	Green Sprangletop Sideoats Grama (Haskell) Bermudagrass Blue Grama (Hachita)	0.3 3.6 1.2 0.9	Green Sprangletop Buffalograss (Texoka) Bermudagrass Sand Dropseed (Borden Co.)	0.3 1.6 3.6 0.4
24 (El Paso) Feb. 1–May 15	Green Sprangletop Sideoats Grama (South Texas) Blue Grama (Hachita) Buffalograss (Texoka)	0.3 3.6 1.2 1.6	Green Sprangletop Buffalograss (Texoka) Sand Dropseed (Borden Co.) Blue Grama (Hachita)	0.3 1.6 0.4 1.8
25 (Childress) Feb. 1–May 15	Green Sprangletop Sideoats Grama (El Reno) Blue Grama (Hachita) Buffalograss (Texoka)	0.3 3.6 1.2 1.6	Green Sprangletop Sand Dropseed (Borden Co.) Buffalograss (Texoka) Bermudagrass	0.3 0.4 1.6 1.8

Table 3
Temporary Cool Season Seeding

Districts	Dates	Seed Mix and Rates (lb. PLS/acre)	
Paris (1), Amarillo (4), Lubbock (5), Dallas (18)	September 1–November 30	Tall Fescue Western Wheatgrass Wheat (Red, Winter)	4.5 5.6 34
Odessa (6), San Angelo (7), El Paso (24)	September 1–November 30	Western Wheatgrass Wheat (Red, Winter)	8.4 50
Waco (9), Tyler (10), Lufkin (11), Austin (14), San Antonio (15), Bryan (17), Atlanta (19)	September 1–November 30	Tall Fescue Oats Wheat	4.5 24 34
Houston (12), Yoakum (13), Corpus Christi (16), Beaumont (20), Pharr (21), Laredo (22)	September 1–November 30	Oats	72
Ft. Worth (2), Wichita Falls (3), Abilene (8), Brownwood (23), Childress (25)	September 1–November 30	Tall Fescue Western Wheatgrass Cereal Rye	4.5 5.6 34

Table 4
Temporary Warm Season Seeding

Districts	Dates	Seed Mix and Rates (lb. PLS/acre)	
All	May 1–August 31	Foxtail Millet	34

2.2. **Fertilizer**. Use fertilizer in conformance with Article 166.2., “Materials.”

2.3. **Vegetative Watering**. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

2.4. **Mulch**.

2.4.1. **Straw or Hay Mulch**. Use straw or hay mulch in conformance with Section 162.2.5., “Mulch.”

2.4.2. **Cellulose Fiber Mulch**. Use only cellulose fiber mulches that are on the Approved Products List, *Erosion Control Approved Products*. (http://www.txdot.gov/business/resources/erosion-control.html) Submit one full set of manufacturer’s literature for the selected material. Keep mulch dry until applied. Do not use molded or rotted material.

2.5. **Tacking Methods**. Use a tacking agent applied in accordance with the manufacturer’s recommendations or a crimping method on all straw or hay mulch operations. Use tacking agents as approved or as specified on the plans.

3. CONSTRUCTION

Cultivate the area to a depth of 4 in. before placing the seed unless otherwise directed. Use approved equipment to vertically track the seedbed as shown on the plans or as directed. Cultivate the seedbed to a depth of 4 in. or mow the area before placement of the permanent seed when performing permanent seeding after an established temporary seeding. Plant the seed specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans.

3.1. **Broadcast Seeding**. Distribute the seed or seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil unless otherwise directed. Apply the mixture to the area to be seeded within 30 min. of placement of components in the equipment when seed and water are to be distributed as a slurry during hydro-seeding. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slopes.

3.2. **Straw or Hay Mulch Seeding**. Plant seed according to Section 164.3.1., "Broadcast Seeding." Apply straw or hay mulch uniformly over the seeded area immediately after planting the seed or seed mixture. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

3.3. **Cellulose Fiber Mulch Seeding**. Plant seed in accordance with Section 164.3.1., "Broadcast Seeding." Apply cellulose fiber mulch uniformly over the seeded area immediately after planting the seed or seed mixture at the following rates.

- Sandy soils with slopes of 3:1 or less—2,500 lb. per acre.
- Sandy soils with slopes greater than 3:1—3,000 lb. per acre.
- Clay soils with slopes of 3:1 or less—2,000 lb. per acre.
- Clay soils with slopes greater than 3:1—2,300 lb. per acre.

Cellulose fiber mulch rates are based on dry weight of mulch per acre. Mix cellulose fiber mulch and water to make a slurry and apply uniformly over the seeded area using suitable equipment.

3.4. **Drill Seeding**. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 in. using a pasture or rangeland type drill unless otherwise directed. Plant seed along the contour of the slopes.

3.5. **Straw or Hay Mulching**. Apply straw or hay mulch uniformly over the area as shown on the plans. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

Apply fertilizer in conformance with Article 166.3., "Construction." Seed and fertilizer may be distributed simultaneously during "Broadcast Seeding" operations, provided each component is applied at the specified rate. Apply half of the required fertilizer during the temporary seeding operation and the other half during the permanent seeding operation when temporary and permanent seeding are both specified for the same area.

Water the seeded areas at the rates and frequencies as shown on the plans or as directed.

4. MEASUREMENT

This Item will be measured by the square yard or by the acre.

5. PAYMENT

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Broadcast Seeding (Perm)" of the rural or urban seed mixture and sandy or clay soil specified, "Broadcast Seeding (Temp)" of warm or cool season specified, "Straw or Hay Mulch Seeding (Perm)" of the rural or urban seed mixture and sandy or clay soil specified, "Straw or Hay Mulch Seeding (Temp)" of warm or cool season specified, "Cellulose Fiber Mulch Seeding (Perm)" of the rural or urban seed mixture and sandy or clay soil specified, "Cellulose Fiber Mulch Seeding (Temp)" of warm or cool season specified, "Drill Seeding (Perm)" of the rural or urban seed mixture and sandy or clay soil specified, "Drill Seeding (Temp)" of warm or cool season specified, and "Straw or Hay Mulching." This price is full compensation for furnishing materials, including water for hydro-seeding and hydro-mulching operations, mowing, labor, equipment, tools, supplies, and incidentals. Fertilizer will not be paid for directly but will be subsidiary to this Item. Water for irrigating the seeded area, when specified, will be paid for under Item 168, "Vegetative Watering."

Item 216
Proof Rolling

1. DESCRIPTION

Proof-roll earthwork, base, or both to locate unstable areas.

2. EQUIPMENT

2.1. **Specified Equipment**. Furnish rollers that weigh at least 25 tons when loaded. The maximum acceptable load is 50 tons. Provide rollers that meet the requirements of Section 210.2.4., "Pneumatic Tire Rollers."

2.2. **Alternative Equipment**. The Contractor may use alternate compaction equipment that produces results equivalent to the specified equipment in the same period of time as approved. Discontinue the use of the alternative equipment and furnish the specified equipment if the desired results are not achieved.

3. CONSTRUCTION

Perform proof rolling as directed. Adjust the load and tire inflation pressures within the range of the manufacturer's charts or tabulations, as directed. Make at least 2 coverages with the proof roller. Offset each trip of the roller by at most one tire width. Operate rollers at a speed between 2 and 6 mph, as directed. Correct unstable or nonuniform areas, if found, in accordance with the applicable Item.

4. MEASUREMENT

Rolling will be measured by the hour operated on surfaces being tested.

5. PAYMENT

The work performed and equipment furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Proof Rolling." This price is full compensation for furnishing and operating equipment and for labor, materials, tools, and incidentals.

Item 400
Excavation and Backfill for Structures

1. DESCRIPTION

Excavate for placement and construction of structures and backfill structures. Cut and restore pavement.

2. MATERIALS

Use materials that meet the requirements of the following Items.

- Item 401, "Flowable Backfill,"
- Item 421, "Hydraulic Cement Concrete," and
- DMS-4600, "Hydraulic Cement."

3. CONSTRUCTION

3.1. **Excavation**.

3.1.1. **General**. Excavate to the lines and grades shown on the plans or as directed. Provide slopes, benching, sheeting, bracing, pumping, and bailing as necessary to maintain the stability and safety of excavations up to 5 ft. deep. Excavation protection for excavations deeper than 5 ft. are governed by Item 402, "Trench Excavation Protection," and Item 403, "Temporary Special Shoring." Use satisfactory excavated material as backfill or as embankment fill in accordance with Item 132, "Embankment." Dispose of material not incorporated into the final project off the right of way in accordance with federal, state, and local regulations.

Keep any topsoil that has been removed separate, and replace it, as nearly as feasible, in its original position when excavating for installation of structures across private property or beyond the limits of the embankment. Restore the area to an acceptable condition.

Excavate drilled shafts in accordance with Item 416, "Drilled Shaft Foundations."

3.1.1.1. **Obstructions**. Remove obstructions to the proposed construction, including trees and other vegetation, debris, and structures, over the width of the excavation to a depth of 1 ft. below the bottom of excavation. Remove as required to clear the new structure and plug in an approved manner if abandoned storm drains, sewers, or other drainage systems are encountered. Restore the bottom of the excavation to grade by backfilling after removing obstructions in accordance with this Item. Dispose of surplus materials in accordance with federal, state, and local regulations.

3.1.1.2. **Excavation in Streets**. Cut pavement and base to neat lines when structures are installed in streets, highways, or other paved areas. Restore pavement structure after completion of excavation and backfilling.

Maintain and control traffic in accordance with the approved traffic control plan and the TMUTCD.

3.1.1.3. **Utilities**. Comply with the requirements of Article 7.15., "Responsibility for Damage Claims." Conduct work with minimum disturbance of existing utilities, and coordinate work in or near utilities with the utility owners. Inform utility owners before work begins, allowing them enough time to identify, locate, reroute, or make other adjustments to utility lines.

Avoid cutting or damaging underground utility lines that are to remain in place. Promptly notify the utility company if damage occurs. Provide temporary flumes across the excavation while open if an active sanitary

sewer line is damaged during excavation, and restore the lines when backfilling has progressed to the original bedding lines of the cut sewer.

3.1.1.4. **De-Watering**. Construct or place structures in the presence of water only if approved. Place precast members, pipe, and concrete only on a dry, firm surface. Remove water by bailing, pumping, well-point installation, deep wells, underdrains, or other approved method.

Remove standing water in a manner that does not allow water movement through or alongside concrete being placed if structures are approved for placement in the presence of water. Pump or bail only from a suitable sump separated from the concrete work while placing structural concrete or for a period of at least 36 hr. thereafter. Pump or bail during placement of seal concrete only to the extent necessary to maintain a static head of water within the cofferdam. Pump or bail to de-water inside a sealed cofferdam only after the seal has aged at least 36 hr.

Place a stabilizing material in the bottom of the excavation if the bottom of an excavation cannot be de-watered to the point the subgrade is free of mud or it is difficult to keep reinforcing steel clean. Use flexible base, cement-stabilized base or backfill, lean concrete, or other approved stabilizing material. Provide concrete with at least 275 lb. of cement per cubic yard, if lean concrete is used, and place to a minimum depth of 3 in. Stabilizing material placed for the convenience of the Contractor will be at the Contractor's expense.

3.1.2. **Bridge Foundations and Retaining Walls**. Do not disturb material below the bottom of footing grade. Do not backfill to compensate for excavation that has extended below grade. Fill the area with concrete at the time the footing is placed if excavation occurs below the proposed footing grade. Additional concrete placed will be at the Contractor's expense.

Take core samples to determine the character of the supporting materials if requested. Provide an intact sample adequate to judge the character of the founding material. Take these cores when the excavation is close to completion. Cores should be approximately 5 ft. deeper than the proposed founding grade.

Remove loose material if the founding stratum is rock or another hard material, and clean and cut it to a firm surface that is level, stepped, or serrated, as directed. Clean out soft seams, and fill with concrete at the time the footing is placed.

Place the foundation once the Engineer has inspected the excavation and authorized changes have been made to provide a uniform bearing condition if the material at the footing grade of a retaining wall, bridge bent, or pier is a mixture of compressible and incompressible material.

3.1.3. **Cofferdams**. The term "cofferdam" designates any temporary or removable structure constructed to hold surrounding earth, water, or both out of the excavation whether the structure is formed of soil, timber, steel, concrete, or a combination of these. Use pumping wells or well points for de-watering cofferdams if required.

Submit details and design calculations for sheet-pile or other types of cofferdams requiring structural members bearing the seal of a licensed professional engineer for review before constructing the cofferdam. The Department reserves the right to reject designs. Design structural systems to comply with the AASHTO *Standard Specifications for Highway Bridges* or AASHTO LRFD *Bridge Design Specifications*. Interior dimensions of cofferdams must provide enough clearance for the construction, inspection, and removal of required forms and, if necessary, enough room to allow pumping outside the forms. Extend sheet-pile cofferdams well below the bottom of the footings, and make concrete seals as well braced and watertight as practicable.

Use Class E concrete for foundation seals unless otherwise specified. Place concrete foundation seals in accordance with Item 420, "Concrete Substructures." Seals placed for the convenience of the Contractor will be at the Contractor's expense.

Make the excavation deep enough to allow for swelling of the material at the base of the excavation during pile-driving operations when the Engineer judges it to be impractical to de-water inside a cofferdam and a

concrete seal is to be placed around piling driven within the cofferdam. Remove swelling material to the bottom of the seal grade after driving the piling. Remove the foundation material to exact footing grades where it is possible to de-water inside the cofferdam without placing a seal after driving piling. Do not backfill a foundation to compensate for excavation that has been extended below grade; fill such areas below grade with concrete at the time the seals or footings are placed.

Remove cofferdams after completing the substructure without disturbing or damaging the structure unless otherwise provided.

3.1.4. **Culverts and Storm Drains**. When the design requires special bedding conditions for culverts or storm drains, an excavation diagram will be shown on the plans. Do not exceed these limits of excavation.

Construct pipe structures in an open cut with vertical sides extending to a point 1 ft. above the pipe unless otherwise shown on the plans. When site conditions or the plans do not prohibit sloping the cut, the excavation may be stepped or laid back to a stable slope beginning 1 ft. above the pipe. Maintain the stability of the excavation throughout the construction period.

Construct the embankment for pipe to be installed in fill above natural ground to an elevation at least 1 ft. above the top of the pipe, and then excavate for the pipe.

3.1.4.1. **Unstable Material**. Remove the material to a depth of no more than 2 ft. below the grade of the structure when unstable soil is encountered at established footing grade, unless the Engineer authorizes additional depth. Replace soil removed with stable material in uniform layers no greater than 8 in. deep (loose measurement). Each layer must have enough moisture to be compacted by rolling or tamping as required to provide a stable foundation for the structure.

Use special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other approved material when it is not feasible to construct a stable foundation as outlined above.

3.1.4.2. **Incompressible Material**. Remove the incompressible material to 6 in. below the footing grade, backfill with an approved compressible material, and compact in accordance with Section 400.3.3., “Backfill,” if rock, part rock, or other incompressible material is encountered at established footing grade while placing prefabricated elements.

3.2. **Shaping and Bedding**. Place at least 2 in. of fine granular material for precast box sections on the base of the excavation before placing the box sections. Use bedding as shown in Figure 1 for pipe installations. Use Class C bedding unless otherwise shown on the plans. The Engineer may require the use of a template to secure reasonably accurate shaping of the foundation material. Undercut the excavation at least 4 in. where cement-stabilized backfill is indicated on the plans and backfill with stabilized material to support the pipe or box at the required grade.

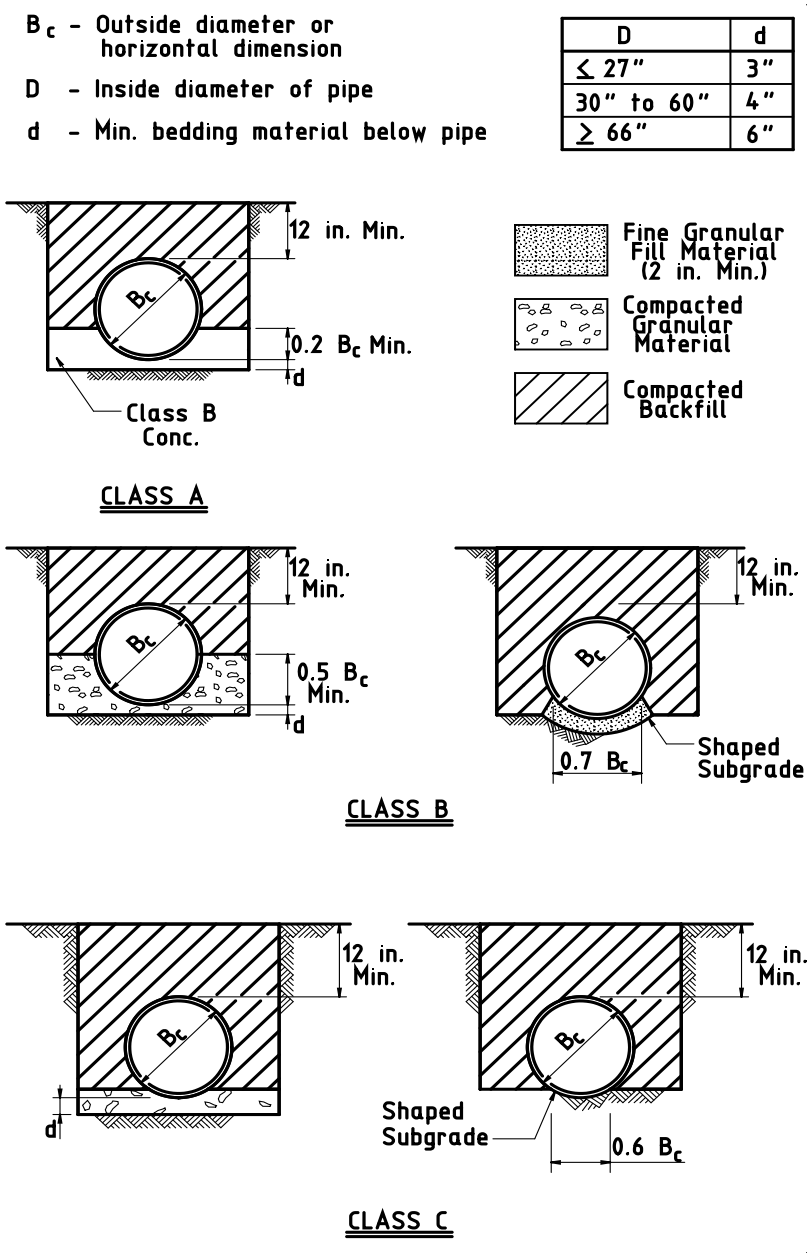


Figure 1
Bedding Diagrams

3.3. **Backfill**.

3.3.1. **General**. Backfill the excavation after placement of the permanent structure as soon as practical. Use backfill free from stones large enough to interfere with compaction; large or frozen lumps that will not break down readily under compaction; and wood or other extraneous material. Obtain backfill material from excavation or from other sources.

Place backfill in layers no greater than 10 in. deep (loose measurement) in areas not supporting a completed roadbed, retaining wall, or embankment. Place backfill in uniform layers no greater than 8 in. deep (loose measurement) in areas supporting a portion of a roadbed, retaining wall, or embankment. Compact each layer to meet the density requirements of the roadbed, retaining wall, embankment material, or as shown on the plans.

Bring each layer of backfill material to the moisture content needed to obtain the required density. Use mechanical tamps or rammers to compact the backfill. Rollers may be used to compact backfill if feasible.

Cohesionless materials may be used for backfilling. Use cohesionless materials that conform to the requirements of Table 1.

Table 1
Cohesionless Material Gradation Limits

Sieve Size	Percent Retained
3"	0
#10	Note 1
#200	90–100

1. No. 10 sieve requirements are 0 to 30% retained when used as aggregate for cement-stabilized backfill.

Compact cohesionless materials using vibratory equipment, water-ponding, or a combination of both.

3.3.2. **Bridge Foundations, Retaining Walls, Manholes/Inlets, and Box Culverts**. Place backfill against the structure only after the concrete has reached the design strength required in Item 421, "Hydraulic Cement Concrete."

Backfill retaining walls with material meeting the requirements of Item 423, "Retaining Walls." Backfill around bridge foundations, manholes/inlets and culverts using material with particles no more than 4 in. in greatest dimension and a gradation that permits thorough compaction. Use rock or gravel mixed with soil if the percentage of fines is enough to fill all voids and ensure a uniform and thoroughly compacted mass of proper density.

Use mechanical tamps and rammers to avoid damage to the structure where backfill material is being placed too close to the structure to permit compaction with blading and rolling equipment.

Avoid wedging action of backfill against structures. Step or serrate slopes bounding the excavation to prevent such action. Place backfill uniformly around bridge foundations. Place backfill equally and in uniform layers along both sides of manholes/inlets and culverts.

The Engineer may require backfilling of structures excavated into hard, erosion-resistant material, and subject to erosive forces, with stone or lean concrete.

Box culverts may be opened to traffic as soon as enough backfill and embankment has been placed over the top to protect culverts against damage from heavy construction equipment. Repair damage to culvert caused by construction traffic at no additional expense to the Department.

3.3.3. **Pipe**. Bring backfill material to the proper moisture condition after installing bedding and pipe as required and place it equally along both sides of the pipe in uniform layers no greater than 8 in. deep (loose measurement). Compact each lift mechanically. Thoroughly compact materials placed under the haunches of the pipe to prevent damage or displacement of the pipe. Place backfill in this manner to the top-of-pipe elevation. Place and compact backfill above the top of the pipe in accordance with Section 400.3.3.1., "General."

The Engineer may reject backfill material containing more than 20% by weight of material retained on a 3 in. sieve with large lumps not easily broken down or that cannot be spread in loose layers. Material excavated by a trenching machine will generally meet the requirements of this Section as long as large stones are not present.

Place and compact additional material where pipe extends beyond the toe of slope of the embankment and the depth of cover provided by backfill to the original ground level is less than the minimum required by the specifications for the type of pipe involved until the minimum cover has been provided.

3.3.4. **Cement-Stabilized Backfill**. Backfill the excavation to the elevations shown with cement-stabilized backfill when shown on the plans. Use cement-stabilized backfill that contains aggregate conforming to the gradation limits shown in Table 1, water, and a minimum of 7% hydraulic cement based on the dry weight of the aggregate, in accordance with Tex-120-E.

Place cement-stabilized backfill equally along the sides of structures to prevent strain on or displacement of the structure. Fill voids when placing cement-stabilized backfill. Use hand-operated tampers if necessary to fill voids.

3.3.5. **Flowable Backfill**. Backfill the excavation with flowable backfill to the elevations indicated when shown on the plans. Prevent the structure from being displaced during the placement of the flowable fill, and prevent flowable fill from entering manholes/inlets and culverts, and drainage structures.

4. MEASUREMENT

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

4.1. **Structural Excavation**. Unless shown on the plans as a pay item, structural excavation quantities shown are for information purposes only.

When structural excavation is specified as a pay item, structural excavation for pipe headwalls, inlets, manholes, culvert or storm drain extensions less than 15 ft. long, bridge abutments, retaining walls, and side road and private entrance pipe culverts will not be measured. No allowance will be made for variance from plans quantity incurred by an alternate bid.

When specified as a pay item, structural excavation will be measured by the cubic yard as computed by the average end areas method. Excavation diagrams on the plans take precedence over the provisions of this Article.

4.1.1. **Boundaries of Measurement**.

4.1.1.1. **Pipe**.

4.1.1.1.1. **Pipe up to 42 Inches**. For pipe up to 42 in. nominal or equivalent diameter, no material outside of vertical planes 1 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

4.1.1.1.2. **Pipe Larger than 42 Inches**. For pipes larger than 42 in. nominal or equivalent diameter, no material outside of vertical planes located 2 ft. beyond and parallel to the horizontal projection of the outside surfaces of the pipe will be included.

Quantities for excavation in fill above natural ground include 1 ft. above the top of the pipe regardless of the height of completed fill. Excavation for pipe will be measured between the extreme ends of the completed structure including end appurtenances as shown on the plans and from centerline to centerline of inlets, manholes, etc.

4.1.1.2. **Structural Plate Structures**. No material outside of vertical planes 3 ft. beyond and parallel to the horizontal projection of the outside surfaces of the structure will be included. When the quality of the existing soil or embankment is less than that of the proposed backfill material, the limits of measurement will be extended to vertical planes located 1/2 of the span beyond the horizontal projection of the outside surfaces of the structure.

4.1.1.3. **Footings, Walls, Boxes, and Other Excavation**. No material outside of vertical planes 1 ft. beyond and parallel to the edges of the footings or outside walls will be included whether or not a cofferdam or shoring is

used. When plans provide the option of cast-in-place or precast boxes, measurement will be based on the cast-in-place option.

Where excavation in addition to that allowed for the footings is required for other portions of the structure, measurement for the additional excavation will be limited laterally by vertical planes 1 ft. beyond the face of the member and parallel to it, and vertically to a depth of 1 ft. below the bottom of the member.

4.1.1.4. **Excavation near Roadways and Channels**. At structure sites other than culverts and pipe excavations, the measurement of structural excavation will include only material below or outside the limits of the completed road or channel excavation. Roadway and channel excavation will be paid under Item 110, "Excavation." For culverts except side road and private entrance culverts, excavation within the limits of the structure and below or outside the limits of the completed roadway excavation will be measured as structural excavation.

4.1.2. **Falsework**. No measurement will be made for excavation necessary for placing forms or falsework that exceeds the limits given in Section 400.4.1.1., "Boundaries of Measurement."

4.1.3. **Swelling**. Measurement will not include materials removed below footing grades to compensate for anticipated swelling due to pile-driving, nor will it include material required to be removed due to swelling beyond the specified limits during pile-driving operations.

4.1.4. **Cave-Ins**. Measurement will not include additional volume caused by slips, slides, cave-ins, silting, or fill material resulting from the action of the elements or the Contractor's operation.

4.1.5. **Undercut**. Where rock or other incompressible or unstable material is undercut to provide a suitable foundation for pipe or box sections, such material below grade directed to be removed will be measured for payment.

4.1.6. **Grade Change**. Additional measurement will be made of the volume of excavation involved in the lowering or raising of the elevation of a footing, foundation, or structure unit, when such grade change is authorized.

4.2. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be measured by the cubic yard as shown on the plans.

4.3. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be measured by the square yard as shown on the plans. Excavation below pavement or base will be measured as structural excavation of the pertinent type.

5. PAYMENT

5.1. **Structural Excavation**. Unless specified as a pay item, structural excavation and backfill performed, and material furnished in accordance with this Item will not be paid for directly but are subsidiary to pertinent Items.

When structural excavation is specified as a pay item, the excavation and backfill work performed, and materials furnished will be paid for at the unit price bid for "Structural Excavation," "Structural Excavation (Box)," "Structural Excavation (Pipe)," and "Structural Excavation (Bridge)." This price includes concrete to compensate for excavation that has extended below grade for bridge foundations and retaining walls, and backfilling and compacting areas that were removed as part of structural excavation.

Cofferdams or other measures necessary for supporting excavations less than 5 ft. deep will not be measured or paid for directly but will be subsidiary to the Contract.

Foundation seal concrete for cofferdams, when required, will be paid for as provided in the pertinent Items. If no direct method of payment is provided in the Contract, the work will be measured and paid for in accordance with Article 9.7., "Payment for Extra Work and Force Account Method." Seal placed for the convenience of the Contractor will not be paid for.

Unless otherwise provided, stone or lean concrete backfill around structures as provided for in Section 400.3.3.2., "Bridge Foundations, Retaining Walls, Manholes/Inlets, and Box Culverts," will be measured and paid for as extra work in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

When structural excavation is specified as a pay item, a partial payment of 50% of the bid price will be made for structural excavation completed to the satisfaction of the Engineer but not backfilled. The remaining amount will be paid upon completion of backfilling. When the Contractor elects to excavate beyond plan requirements, no measurement will be made of the additional volume.

5.2. **Removal and Replacement of Unsuitable or Incompressible Material**. Removal and replacement of material will be paid for if directed. Removal and replacement of material or placement of special material made necessary by the softening of founding material due to the Contractor's sequence of work or operation, will be at the Contractor's expense. Special material used or additional excavation made for the Contractor's convenience will not be paid for.

5.2.1. **Structural Excavation as a Pay Item**. Where special materials are not required or specified, payment for the removal and replacement of unstable or incompressible material will be made at a price equal to 200% of the unit price bid per cubic yard for Structural Excavation. When the Contractor elects to remove and replace material deeper than directed, no measurement will be made on that portion below the directed elevation. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when directed, the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, payment for excavation below footing grades will be made at the unit price bid for Structural Excavation. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items in the Contract, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.2.2. **Structural Excavation Not a Pay Item**. Where special materials for backfill are not required or specified, payment for the authorized removal and replacement of unstable or incompressible material will be measured and paid for at $15 per cubic yard of material removed. This price is full compensation for removing the unstable or incompressible material; furnishing, hauling, placing, and compacting suitable replacement material; and equipment, labor, tools, and incidentals.

When the plans specify or when directed, the use of special materials such as flexible base, cement-stabilized base, cement-stabilized backfill, or other special material, excavation below the footing grades will be paid for at $10 per cubic yard. Payment for furnishing, hauling, placing, and compacting the flexible base, cement-stabilized base, cement-stabilized backfill, or other special materials will be made at the unit price bid for these items, or, if the required material is not a bid item, in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

5.3. **Lowering of a Structure Foundation**. If the Engineer requires a structure foundation to be lowered to an elevation below the grade shown on the plans, overexcavation will be paid in accordance with Table 2.

Table 2
Payment for Required Overexcavation

Variance of Revised Footing Grade from Plan Grade	Payment Terms	Variance of Revised Footing Grade from Plan Grade
	"Structural Excavation" is a Bid Item	"Structural Excavation" is not a Bid Item
Up to and including 5 ft.	Unit price equal to 115% of unit price bid for "Structural Excavation"	$10 per cubic yard
Over 5 ft. up to 10 ft.	Unit price equal to 125% of unit price bid for "Structural Excavation"	$12 per cubic yard
Over 10 ft.	In accordance with Article 9.7., "Payment for Extra Work and Force Account Method."	

5.4. **Cement-Stabilized Backfill**. Cement-stabilized backfill will be paid for at the unit price bid for "Cement-Stabilized Backfill."

5.5. **Cutting and Restoring Pavement**. Cutting and restoring pavement will be paid for at the unit price bid for "Cutting and Restoring Pavement" of the type specified.

Work done to repair damage to base or pavement incurred outside the limits shown on the plans, or the limits authorized, will not be measured for payment.

The unit prices bid are full compensation for excavation including removing obstructions and plugging drainage systems; bedding and backfilling including placing, sprinkling and compaction of material; soundings; cleaning and filling seams; constructing and removing cofferdams; de-watering, sheeting, or bracing excavations up to and including 5 ft. deep; pumps; drills; explosives; disposition of surplus material; cutting pavement and base to neat lines; and materials, hauling, equipment, labor, tools, and incidentals.

Flowable backfill will be paid for as provided in Item 401, "Flowable Backfill." Protection methods for open excavations deeper than 5 ft. will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring."

Item 402
Trench Excavation Protection

1. DESCRIPTION

Furnish and place excavation protection for trenches 5 ft. or greater in depth.

2. CONSTRUCTION

Provide vertical or sloped cuts, benches, shields, support systems, or other systems providing the necessary protection in accordance with OSHA Standards and Interpretations, 29 CFR Part 1926, Subpart P, "Excavations."

3. MEASUREMENT

This Item will be measured by the foot along the long axis of the trench where the depth of trench exceeds 5 ft. This measurement includes all required trench protection, including trench ends.

4. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Trench Excavation Protection." This price is full compensation for excavation and backfill required for excavation protection; furnishing, placing, and removing shoring, sheeting, or bracing; de-watering or diversion of water; jacking and jack removal; and equipment, labor, materials, tools, and incidentals.

Item 421
Hydraulic Cement Concrete

1. DESCRIPTION

Furnish hydraulic cement concrete for concrete pavements, concrete structures, and other concrete construction.

2. MATERIALS

Use materials from prequalified sources listed on the Department website. Provide coarse and fine aggregates from sources listed in the Department's *Concrete Rated Source Quality Catalog* (CRSQC). Use materials from non-listed sources only when tested and approved by the Engineer before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources. Do not combine approved material with unapproved material.

2.1. **Cement**. Furnish cement conforming to DMS-4600, "Hydraulic Cement."

2.2. **Supplementary Cementing Materials (SCM)**.

- **Fly Ash**. Furnish fly ash, ultra-fine fly ash (UFFA), and modified Class F fly ash (MFFA) conforming to DMS-4610, "Fly Ash."
- **Slag Cement**. Furnish Slag Cement conforming to DMS-4620, "Slag Cement."
- **Silica Fume**. Furnish silica fume conforming to DMS-4630, "Silica Fume."
- **Metakaolin**. Furnish metakaolin conforming to DMS-4635, "Metakaolin."

2.3. **Cementitious Material**. Cementitious materials are the cement and supplementary cementing materials used in concrete.

2.4. **Chemical Admixtures**. Furnish admixtures conforming to DMS-4640, "Chemical Admixtures for Concrete."

2.5. **Water**. Furnish mixing and curing water that is free from oils, acids, organic matter, or other deleterious substances. Water from municipal supplies approved by the Texas Department of Health will not require testing. Provide test reports showing compliance with Table 1 before use when using water from other sources.

Water that is a blend of concrete wash water and other acceptable water sources, certified by the concrete producer as complying with the requirements of both Table 1 and Table 2, may be used as mix water. Test the blended water weekly for 4 weeks for compliance with Table 1 and Table 2 or provide previous test results. Then test every month for compliance. Provide water test results upon request.

Table 1
Chemical Limits for Mix Water

Contaminant	Test Method	Maximum Concentration (ppm or mg\L)
Chloride (Cl)	ASTM C114	
Prestressed concrete		500
Bridge decks & superstructure		500
All other concrete		1,000
Sulfate (SO4)	ASTM C114	2,000
Alkalies (Na2O + 0.658K2O)	ASTM C114	600
Total solids	ASTM C1603	50,000

Table 2
Acceptance Criteria for Questionable Water Supplies

Property	Test Method	Limits
Compressive strength, min % control at 7 days	ASTM C31, ASTM C39[1,2]	90
Time of set, deviation from control, h:min.	ASTM C403	From 1:00 early to 1:30 later

1. Base comparisons on fixed proportions and the same volume of test water compared to the control mix using 100% potable water or distilled water.
2. Base comparisons on sets consisting of at least 2 standard specimens made from a composite sample.

Do not use mix water that has an adverse effect on the air-entraining agent, on any other chemical admixture, or on strength or time of set of the concrete. Use mixing and curing water free of iron and other impurities that may cause staining or discoloration when using white hydraulic cement.

2.6. **Aggregate**.

2.6.1. **Coarse Aggregate**. Provide coarse aggregate consisting of durable particles of gravel, crushed blast furnace slag, recycled crushed hydraulic cement concrete, crushed stone, or combinations which are free from frozen material and from injurious amounts of salt, alkali, vegetable matter, or other objectionable material, either free or as an adherent coating. Provide coarse aggregate of uniform quality throughout.

Provide coarse aggregate with the requirements listed in Table 3 unless otherwise shown on the plans.

Table 3
Coarse Aggregate Requirements

Description	Test Method	Limit
Weight of Clay Lumps, % Max	Tex-413-A	0.25
Weight of Shale, % Max		1.0
Weight of Laminate and Friable Particle, % Max		5.0
L.A. Abrasion Wear, % Max	Tex-410-A	40
5-Cycle Magnesium Sulfate Soundness,[1,2] non-air-entrained concrete, % Max	Tex-411-A	25
5-Cycle Magnesium Sulfate Soundness,[1,3] air-entrained concrete, % Max		18
Loss by Decantation, % Max	Tex-406-A	1.5

1. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
2. Allowed when air-entrained concrete is used at the Contractor's option.
3. Only when air-entrained concrete is required by the plans.

Increase the loss by decantation limit to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with Tex-406-A, Part III, in the case of coarse aggregates made primarily from crushing stone unless otherwise shown on the plans. Provide test results upon request.

Provide coarse aggregate or combination of aggregates conforming to the gradation requirements shown in Table 4 when tested in accordance with Tex-401-A unless otherwise specified.

Table 4
Coarse Aggregate Gradation Chart

Aggregate Grade No.[1]	Maximum Nominal Size	Percent Passing on Each Sieve								
		2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
1	2"	100	80–100	50–85		20–40			0–10	
2	1-1/2"		100	95–100		35–70		10–30	0–10	
3	1-1/2"		100	95–100		60–90	25–60		0–10	
4 (57)	1"			100	95–100		25–60		0–10	0–5
5 (67)	3/4"				100	90–100		20–55	0–10	0–5
6 (7)	1/2"					100	90–100	40–70	0–15	0–5
7	3/8"						100	70–95	0–25	
8	3/8"						100	95–100	20–65	0–10

1. Corresponding ASTM C33 gradation shown in parentheses.

2.6.2. **Fine Aggregate**. Provide fine aggregate consisting of clean, hard, durable particles of natural, manufactured sand, recycled crushed hydraulic cement concrete, slag, lightweight aggregate, or a combination thereof. Provide fine aggregate free from frozen material and from injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide fine aggregates with the requirements in Table 5 unless otherwise shown on the plans.

Table 5
Fine Aggregate Requirements

Description	Test Method	Limit
Weight of Clay Lumps, % Max	Tex-413-A	0.50
Organic Impurities[1]	Tex-408-A	Color not darker than standard
Sand Equivalent	Tex-203-F	80
Fineness Modulus	Tex-402-A	2.3 to 3.1

1. Only when air-entrained concrete is specified.

Provide fine aggregate or combinations of aggregates conforming to the gradation requirements shown in Table 6 when tested in accordance with Tex-401-A unless otherwise specified.

Table 6
Fine Aggregate Gradation Chart (Grade 1)

Sieve Size	Percent Passing
3/8"	100
#4	95–100
#8	80–100
#16	50–85
#30	25–65
#50	10–35[1]
#100	0–10
#200	0–3[2]

1. 6–35 when sand equivalent value is greater than 85.
2. 0–6 for manufactured sand.

2.6.3. **Intermediate Aggregate**. Provide intermediate aggregate consisting of clean, hard, durable particles of natural, manufactured sand, slag, recycled crushed hydraulic cement concrete, lightweight aggregate, or a combination thereof when optimized aggregate gradation (OAG) concrete is specified or when used at the Contractor's option. Provide intermediate aggregate free from frozen material and injurious amounts of salt, alkali, vegetable matter, or other objectionable material.

Provide intermediate aggregate with the requirements in Table 7.

Table 7
Intermediate Aggregate Requirements

Description	Test Method	Limit
Weight of Clay Lumps, % Max	Tex-413-A	0.50
L.A. Abrasion Wear,[1] % Max	Tex-410-A	40
5-Cycle Magnesium Sulfate Soundness,[1,2,3] non-air-entrained concrete, % Max	Tex-411-A	25
5-Cycle Magnesium Sulfate Soundness,[1,2,4] air-entrained concrete, % Max		18
Organic Impurities[5]	Tex-408-A	Color not darker than standard
Loss by Decantation,[1] % Max	Tex-406-A	1.5

1. Only applies to the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve.
2. Recycled crushed hydraulic cement concrete is not subject to 5-cycle magnesium sulfate soundness requirements.
3. Allowed when air-entrained concrete is used at the Contractor's option.
4. Only when air-entrained concrete is required by the plans.
5. Only applies to the portion passing the 3/8 in. sieve, if more than 30% of the intermediate aggregate is passing the 3/8 in. sieve.

For the portion retained on the No. 4 sieve, if more than 30% of the intermediate aggregate is retained on the No. 4 sieve, and in the case of aggregates made primarily from crushing stone, unless otherwise shown on the plans, the loss by decantation may be increased to 3.0% for all classes of concrete and 5.0% for Class A, B, and P if the material finer than the No. 200 sieve is determined to be at least 85% calcium carbonate in accordance with Tex-406-A, Part III. Provide test results upon request.

2.7. **Mortar and Grout**. Furnish pre-packaged grouts conforming to DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications," when specified for applications other than post-tension grouting.

Section 421.4.2.6., "Mix Design Options," does not apply for mortar and grout.

2.8. **Storage of Materials**.

2.8.1. **Cement and Supplementary Cementing Materials**. Store all cement and supplementary cementing materials in weatherproof enclosures that will protect them from dampness or absorption of moisture.

When permitted, small quantities of packaged cementitious material may be stored in the open, on a raised platform, and under waterproof covering for up to 48 hr.

2.8.2. **Aggregates**. Handle and store concrete aggregates in a manner that prevents contamination with foreign materials. Clear and level the sites for the stockpiles of all vegetation if the aggregates are stored on the ground and do not use the bottom 6-in. layer of aggregate without cleaning the aggregate before use.

Maintain separate stockpiles and prevent intermixing when conditions require the use of 2 or more grades of coarse aggregates. Separate the stockpiles using physical barriers where space is limited. Store aggregates from different sources in different stockpiles unless the Engineer authorizes pre-blending of the aggregates. Minimize segregation in stockpiles. Remix and test stockpiles when segregation is apparent.

Sprinkle stockpiles to control moisture and temperature as necessary. Maintain reasonably uniform moisture content in aggregate stockpiles.

2.8.3. **Chemical Admixtures**. Store admixtures in accordance with manufacturer's recommendations and prevent admixtures from freezing.

3. EQUIPMENT

3.1. **Concrete Plants and Mixing Equipment**. Except for volumetric stationary plant or truck (auger) mixers, each plant and truck mixer must be currently certified by the National Ready Mixed Concrete Association (NRMCA) or have an inspection report signed and sealed by a licensed professional engineer showing concrete measuring, mixing, and delivery equipment meets all requirements of ASTM C94. A new

certification or signed and sealed report is required every time a plant is moved. Plants with a licensed professional engineer's inspection require re-inspection every 2 yr. Provide a copy of the certification or the signed and sealed inspection report to the Engineer. Remove equipment or facilities from service until corrected when they fail to meet specification requirements.

When allowed on the plans or by the Engineer, for concrete classes not identified as structural concrete in Table 8 or for Class C concrete not used for bridge-class structures, the Engineer may inspect and approve all plants and trucks instead of the NRMCA or non-Department engineer-sealed certifications. The criteria and frequency of Engineer approval of plants and trucks is the same used for NRMCA certification.

Inspect and furnish inspection reports on the condition of blades and fins and their percent wear from the original manufacturer's design for truck mixers and agitators annually. Repair mixing equipment exhibiting 10% or more wear before use. If an inspection within 12 mo. is not practical, a 2-mo. grace period (for a maximum of 14 mo. between inspections) is permitted.

3.1.1. **Scales**. Check all scales before beginning of operations, after each move, or whenever their accuracy or adequacy is questioned, and at least once every 6 mo. Immediately correct deficiencies, and recalibrate. Provide a record of calibration showing scales in compliance with ASTM C94 requirements. Check batching accuracy of volumetric water batching devices at least every 90 days. Check batching accuracy of chemical admixture dispensing devices at least every 6 mo. Perform daily checks as necessary to ensure measuring accuracy.

3.1.2. **Volumetric Mixers**. Provide volumetric mixers with rating plates defining the capacity and the performance of the mixer in accordance with the Volumetric Mixer Manufacturers Bureau or equivalent. Provide volumetric mixers that comply with ASTM C685. Provide test data showing mixers meet the uniformity test requirements of Tex-472-A.

Unless allowed on the plans or by the Engineer, volumetric truck (auger) mixers may not supply classes of concrete identified as structural concrete in Table 8.

3.1.3. **Agitators and Truck and Stationary Mixers**. Provide stationary and truck mixers capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and capable of discharging the concrete so at least 5 of the 6 requirements of Tex-472-A are met.

Perform concrete uniformity tests on mixers or agitators in accordance with Tex-472-A as directed, to resolve issues of mix uniformity and mixer performance.

Perform the mixer or agitator uniformity test at the full rated capacity of the equipment. Remove all equipment that fails the uniformity test from service.

Inspect and maintain mixers and agitators. Keep them free of concrete buildup, and repair or replace worn or damaged blades or fins.

Ensure all mixers have a plate affixed showing manufacturer's recommended operating speed and rated capacity for mixing and agitating.

3.2. **Hauling Equipment**. Provide hauling equipment capable of maintaining the mixed concrete in a thoroughly mixed and uniform mass, and discharging the concrete with a satisfactory degree of uniformity.

Provide equipment with smooth, mortar-tight metal containers equipped with gates that prevent accidental discharge of the concrete when using non-agitating equipment for transporting concrete.

Maintain hauling equipment clean and free of built-up concrete.

3.3. **Testing Equipment**. Furnish and maintain the following in accordance with the pertinent test procedure unless otherwise shown on the plans or specified:

- sieves necessary to perform aggregate gradation analysis when optimized aggregate gradation is specified,
- equipment necessary to perform Tex-415-A and Tex-422-A,
- equipment necessary to perform Tex-409-A or Tex-425-A,
- test molds,
- curing facilities,
- maturity meters if used, and
- wheelbarrow or other container acceptable for the sampling of the concrete.

Provide strength-testing equipment when required in accordance with the Contract-controlling test unless shown otherwise.

4. CONSTRUCTION

4.1. **Classification of Concrete Mix Designs**. Provide classes of concrete meeting the requirements shown in Table 8.

A higher-strength class of concrete with equal or lower water-to-cementitious material (w/cm) ratio may be substituted for the specified class of concrete when approved.

4.2. **Mix Design Proportioning**. Furnish mix designs using ACI 211, Tex-470-A, or other approved procedures for the classes of concrete listed in Table 8 unless a design method is indicated on the plans. Perform mix design proportioning by absolute volume method unless otherwise approved. Perform cement replacement using equivalent weight method unless otherwise approved.

Do not exceed the maximum w/cm ratio listed in Table 8 when designing the mixture.

4.2.1. **Cementitious Materials**. Do not exceed 700 lb. of cementitious material per cubic yard of concrete unless otherwise specified or approved.

- Use cement of the same type and from the same source for monolithic placements.
- Do not use supplementary cementing materials when white hydraulic cement is specified.

Table 8
Concrete Classes

Class of Concrete	Design Strength,[1] Min f'_c (psi)	Max w/cm Ratio	Coarse Aggregate Grades[2,3,4]	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage[5]
A	3,000	0.60	1–4, 8	I, II, I/II, IL, IP, IS, IT, V	1, 2, 4, & 7	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Curb, gutter, curb & gutter, conc. retards, sidewalks, driveways, back-up walls, anchors, non-reinforced drilled shafts
B	2,000	0.60	2–7				Riprap, traffic signal controller foundations, small roadside signs, and anchors
C[6]	3,600	0.45	1–6	I, II, I/II, IP, IS, IT,[7] V	1–8		Drilled shafts, bridge substructure, bridge railing, culverts except top slab of direct traffic culverts, headwalls, wing walls, inlets, manholes, concrete traffic barrier (cast-in-place)
E	3,000	0.50	2–5	I, II, I/II, IL, IP, IS, IT,[7] V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Seal concrete

Table 8 (continued)
Concrete Classes

Class of Concrete	Design Strength,[1] Min f'c (psi)	Max w/cm Ratio	Coarse Aggregate Grades[2,3,4]	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage[5]
F[6]	Note 8	0.45	2–5	I, II, I/II, IP, IS, IT,[7]V			Railroad structures; occasionally for bridge piers, columns, or bents
H[6]	Note 8	0.45	3–6	I, II, I/II, III, IP, IS, IT,[7] V	1–5	Do not use Type III cement in mass placement concrete. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete.	Precast concrete, post-tension members
S[6]	4,000	0.45	2–5	I, II, I/II, IP, IS, IT,[7]V	1–8		Bridge slabs, top slabs of direct traffic culverts, approach slabs
P	See Item 360, "Concrete Pavement."	0.50	2–3	I, II, I/II, IL, IP, IS, IT, V	1–8	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Concrete pavement
CO[6]	4,600	0.40	6	I, II, I/II, IP, IS, IT,[7] V	1–8		Bridge deck concrete overlay
LMC[6]	4,000	0.40	6–8				Latex-modified concrete overlay
SS[6]	3,600	0.45	4–6			Use a minimum cementitious material content of 658 lb./cu. yd. of concrete.	Slurry displacement shafts, underwater drilled shafts
K[6]	Note 8	0.40	Note 8	I, II, I/II, III IP, IS, IT,[7] V			Note 8
HES	Note 8	0.45	Note 8	I, IL, II, I/II, III		Mix design options do not apply. 700 lb. of cementitious material per cubic yard limit does not apply.	Concrete pavement, concrete pavement repair
"X" (HPC) [6,9,10]	Note 11	0.45	Note 11	I, II, I/II, III IP, IS, IT,[7] V	1–5, & 8	Maximum fly ash replacement for Options 1 and 3 may be increased to 45%. Up to 20% of a blended cement may be replaced with listed SCMs for Option 4. Do not use Option 8 for precast concrete.	
"X" (SRC) [6,9,10]	Note 11	0.45	Note 11	I/II, II, IP, IS, IT,[7] V	1–4 , & 7	Do not use Class C Fly Ash Type III-MS may be used where allowed. Type I and Type III cements may be used with Options 1–3, with a maximum w/cm of 0.40. Up to 20% of blended cement may be replaced with listed SCMs when Option 4 is used for precast concrete. Do not use Option 7 for precast concrete.	

1. Design strength must be attained within 56 days.
2. Do not use Grade 1 coarse aggregate except in massive foundations with 4 in. minimum clear spacing between reinforcing steel bars, unless otherwise permitted. Do not use Grade 1 aggregate in drilled shafts.
3. Use Grade 8 aggregate in extruded curbs unless otherwise approved.
4. Other grades of coarse aggregate maybe used in non-structural concrete classes when allowed by the Engineer.
5. For information only.
6. Structural concrete classes.
7. Do not use Type IT cements containing > 5% limestone.
8. As shown on the plans or specified.
9. "X" denotes class of concrete shown on the plans or specified.
10. (HPC): High Performance Concrete, (SRC): Sulfate Resistant Concrete.
11. Same as class of concrete shown on the plans.

4.2.2. **Aggregates**. Recycled crushed hydraulic cement concrete may be used as a coarse or fine aggregate in Class A, B, E, and P concrete. Limit recycled crushed concrete fine aggregate to a maximum of 20% of the fine aggregate.

Use light-colored aggregates when white hydraulic cement is specified.

Use fine aggregate with an acid insoluble residue of at least 60% by weight when tested in accordance with Tex-612-J in all concrete subject to direct traffic.

Use the following equation to determine if the aggregate combination meets the acid insoluble residue requirement when blending fine aggregate or using an intermediate aggregate:

$$\frac{(A_1 \times P_1)+(A_2 \times P_2)+(A_{ia} \times P_{ia})}{100} \geq 60\%$$

where:
A_1 = acid insoluble (%) of fine aggregate 1
A_2 = acid insoluble (%) of fine aggregate 2
A_{ia} = acid insoluble (%) of intermediate aggregate passing the 3/8 in. sieve
P_1 = percent by weight of fine aggregate 1 of the fine aggregate blend
P_2 = percent by weight of fine aggregate 2 of the fine aggregate blend
P_{ia} = percent by weight of intermediate aggregate passing the 3/8 in. sieve

Alternatively to the above equation, blend fine aggregate with a micro-deval loss of less than 12%, when tested in accordance with Tex-461-A, with at least 40% of a fine aggregate with an acid insoluble residue of at least 60%.

4.2.3. **Chemical Admixtures**. Do not use Type C, Type E, Type F, or Type G admixtures in Class S bridge deck concrete. Do not use chemical admixtures containing calcium chloride in any concrete.

Use a 30% calcium nitrite solution when a corrosion-inhibiting admixture is required. The corrosion-inhibiting admixture must be set neutral unless otherwise approved. Dose the admixture at the rate of gallons of admixture per cubic yard of concrete shown on the plans.

4.2.4. **Air Entrainment**. Use an approved air-entraining admixture when air-entrained concrete is specified, or when an air-entraining admixture is used at the Contractor's option, and do not exceed the manufacturer's recommended dosage. Ensure the minimum entrained air content is at least 3.0% for all classes of concrete except Class P when air-entrained concrete is specified, during trial batch, or when providing previous field data.

4.2.5. **Slump**. Provide concrete with a slump in accordance with Table 9 unless otherwise specified. When approved, the slump of a given concrete mix may be increased above the values shown in Table 9 using chemical admixtures, provided the admixture-treated concrete has the same or lower water-to-cementitious material ratio and does not exhibit segregation or excessive bleeding. Request approval to exceed the slump limits in Table 9 sufficiently in advance for proper evaluation by the Engineer.

Perform job-control testing of slump in accordance with Section 421.4.8.3.1., "Job-Control Testing."

Table 9
Placement Slump Requirements

General Usage[1]	Placement Slump Range,[2] in.
Walls (over 9 in. thick), caps, columns, piers, approach slabs, concrete overlays	3 to 5
Bridge slabs, top slabs of direct traffic culverts, latex-modified concrete for bridge deck overlays	3 to 5-1/2
Inlets, manholes, walls (less than 9 in. thick), bridge railing, culverts, concrete traffic barrier, concrete pavement (formed), seal concrete	4 to 5-1/2
Precast concrete	4 to 9
Underwater concrete placements	6 to 8-1/2
Drilled shafts, slurry displaced and underwater drilled shafts	See Item 416, "Drilled Shaft Foundations."
Curb, gutter, curb and gutter, concrete retards, sidewalk, driveways, anchors, riprap, small roadside sign foundations, concrete pavement repair, concrete repair	As approved

1. For information only.
2. For fiber reinforced concrete, perform slump before addition of fibers.

4.2.6. **Mix Design Options**.

4.2.6.1. **Option 1**. Replace 20% to 35% of the cement with Class F fly ash.

4.2.6.2. **Option 2**. Replace 35% to 50% of the cement with slag cement or MFFA.

4.2.6.3. **Option 3**. Replace 35% to 50% of the cement with a combination of Class F fly ash, slag cement, MFFA, UFFA, metakaolin, or silica fume; however, no more than 35% may be fly ash, and no more than 10% may be silica fume.

4.2.6.4. **Option 4**. Use Type IP, Type IS, or Type IT cement as allowed in Table 5 for each class of concrete. Up to 10% of a Type IP, Type IS, or Type IT cement may be replaced with Class F fly ash, slag cement, or silica fume. Use no more than 10% silica fume in the final cementitious material mixture if the Type IT cement contains silica fume, and silica fume is used to replace the cement.

4.2.6.5. **Option 5**. Replace 35% to 50% of the cement with a combination of Class C fly ash and at least 6% of silica fume, UFFA, or metakaolin. However, no more than 35% may be Class C fly ash, and no more than 10% may be silica fume.

4.2.6.6. **Option 6**. Use a lithium nitrate admixture at a minimum dosage determined by testing conducted in accordance with Tex-471-A. Before use of the mix, provide an annual certified test report signed and sealed by a licensed professional engineer, from a laboratory on the Department's MPL, certified by the Construction Division as being capable of testing according to Tex-471-A.

4.2.6.7. **Option 7**. Ensure the total alkali contribution from the cement in the concrete does not exceed 3.5 lb. per cubic yard of concrete when using hydraulic cement not containing SCMs calculated as follows:

$$\text{lb. alkali per cu. yd.} = \frac{(\text{lb. cement per cu. yd.}) \times (\%\ \text{Na}_2\text{O equivalent in cement})}{100}$$

In the above calculation, use the maximum cement alkali content reported on the cement mill certificate.

4.2.6.8. **Option 8**. Perform annual testing as required for any deviations from Options 1–5 or use mix design options listed in Table 10. Laboratories performing ASTM C1260, ASTM C1567, and ASTM C1293 testing must be listed on the Department's MPL. Before use of the mix, provide a certified test report signed and sealed by a licensed professional engineer demonstrating the proposed mixture conforms to the requirements of Table 10.

Provide a certified test report signed and sealed by a licensed professional engineer, when HPC is required, and less than 20% of the cement is replaced with SCMs, demonstrating ASTM C1202 test results indicate the permeability of the concrete is less than 1,500 coulombs tested immediately after either of the following curing schedules:

- Moisture cure specimens 56 days at 73°F.
- Moisture cure specimens 7 days at 73°F followed by 21 days at 100°F.

Table 10
Option 8 Testing and Mix Design Requirements

Scenario	ASTM C1260 Result		Testing Requirements for Mix Design Materials or Prescriptive Mix Design Options[1]
	Mix Design Fine Aggregate	Mix Design Coarse Aggregate	
A	> 0.10%	> 0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of each aggregate[2] to 0.08% when tested individually in accordance with ASTM C1567; or Use a minimum of 40% Class C fly ash with a maximum CaO[3] content of 25%.
B	≤ 0.10%	≤ 0.10%	Use a minimum of 40% Class C fly ash with a maximum CaO[3] content of 25%; or Use any ternary combination which replaces 35% to 50% of cement.
	≤ 0.10%	ASTM C1293 1 yr. Expansion ≤ 0.04%	Use a minimum of 20% of any Class C fly ash; or Use any ternary combination which replaces 35% to 50% of cement.
C	≤ 0.10%	> 0.10%	Determine the dosage of SCMs needed to limit the 14-day expansion of coarse and intermediate[2] aggregate to 0.08% when tested individually in accordance with ASTM C1567; or Use a minimum of 40% Class C fly ash with a maximum CaO[3] content of 25%.
D	> 0.10%	≤ 0.10%	Use a minimum of 40% Class C fly ash with a maximum CaO[3] content of 25%; or Use any ternary combination which replaces 35% to 50% of cement.
	> 0.10%	ASTM C1293 1 yr. Expansion ≤ 0.04%	Determine the dosage of SCMs needed to limit the 14-day expansion of fine aggregate to 0.08% when tested in accordance with ASTM C1567.

1. Do not use Class C fly ash if the ASTM C1260 value of the fine, intermediate, or coarse aggregate is 0.30% or greater, unless the fly ash is used as part of a ternary system.
2. Intermediate size aggregates will fall under the requirements of mix design coarse aggregate.
3. Average the CaO content from the previous ten values as listed on the mill certificate.

4.2.7. **Optimized Aggregate Gradation (OAG) Concrete**. The gradation requirements in Table 3 and Table 4 do not apply when OAG concrete is specified or used by the Contractor unless otherwise shown on the plans. Use Tex-470-A to establish the optimized aggregate gradation. Use at least 420 lb. per cubic yard of cementitious material when OAG concrete is used unless otherwise approved. Use a coarse aggregate with a maximum nominal size of 1-1/2 in. for Class P concrete. Use a coarse aggregate for all other classes of concrete with a maximum nominal size not larger than:

- 1/5 the narrowest dimension between sides of forms, or
- 1/3 the depth of slabs, or
- 3/4 the minimum clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, bundled tendons, or ducts.

Make necessary adjustments to individual aggregate stockpile proportions during OAG concrete production when the gradation deviates from the optimized gradation requirements.

4.2.8. **Self-Consolidating Concrete (SCC)**. Provide SCC meeting the following requirements shown in Table 11 when approved for use in precast concrete. Use concrete with a slump flow that can be placed without vibration and will not segregate or excessively bleed.

Request approval to exceed the slump flow limits sufficiently in advance for proper evaluation by the Engineer.

Table 11
Mix Design Requirements for SCC

Tests	Test Method	Acceptable Limits
Slump Flow for Precast Concrete	ASTM C1611	22 to 27[1]
T_{50}, sec	ASTM C1611	2 to 7
VSI Rating	ASTM C1611	0 or 1
Passing Ability, in.	ASTM C1621	≤ 2
Segregation Column, %	ASTM C1610	≤ 10
Bleeding, %	ASTM C232	≤ 2.5

1. These slump flow limits are generally acceptable for most applications. However, slump flow limits may be adjusted during mix design approval process and when approved by the Engineer.

4.3. **Concrete Trial Batches**. Perform preliminary and final trial batches when required by the plans, or when previous satisfactory field data is not available. Submit previous satisfactory field data to the Engineer showing the proposed mix design conforms to specification requirements when trial batches are not required and before concrete is placed.

Perform preliminary and final trial batches for all self-consolidating concrete mix designs.

4.3.1. **Preliminary Trial Batches**. Perform all necessary preliminary trial batch testing when required, and provide documentation including mix design, material proportions, and test results substantiating the mix design conforms to specification requirements.

4.3.2. **Final Trial batches**. Make all final trial batches using the proposed ingredients in a mixer that is representative of the mixers to be used on the job when required. Make the batch size at least 50% of the mixer's rated capacity. Perform fresh concrete tests for air content and slump, and make, cure, and test strength specimens for compliance with specification requirements. Test at least one set of design strength specimens, consisting of 2 specimens per set, at 7-day, 28-day, and at least one additional age unless otherwise directed. Before placing, provide the Engineer the option of witnessing final trial batches, including the testing of the concrete. If not provided this option, the Engineer may require additional trial batches, including testing, before the concrete is placed.

Conduct all testing listed in Table 11 when performing trial batches for self-consolidating concrete. Make an additional mixture with 3% more water than the preliminary trial batch. Make necessary adjustments to the mix design if this additional mixture does not meet requirements of Table 11. Cast and evaluate mock-ups for precast concrete that are representative of the actual product as directed. Provide the Engineer the option of witnessing final trial batches, including the testing of the concrete and the casting of the mock-ups before placement. If not provided this option, the Engineer may require additional trial batches, including testing and mock-ups, before the concrete is placed.

Establish 7-day compressive strength target values using the following formula for each Class A, B, and E concrete mix designs to be used:

$$\text{Target value} = \text{Minimum design strength} \times \frac{\text{7 - day avg. trial batch strength}}{\text{28 - day avg. trial batch strength}}$$

Submit previous satisfactory field data, data from a new trial batch, or other evidence showing the change will not adversely affect the relevant properties of the concrete when changes are made to the type, brand, or source of aggregates, cement, SCM, water, or chemical admixtures. Submit the data for approval before making changes to the mix design. A change in vendor does not necessarily constitute a change in materials or source. The Engineer may waive new trial batches when there is a prior record of satisfactory performance with the ingredients. During concrete production, dosage changes of chemical admixtures used in the trial batches will not require a re-evaluation of the mix design.

The Contractor has the option of performing trial batches in conjunction with concrete placements except for SCC mixtures, when new trial batches are required during the course of the project. If the concrete fails to meet any requirement, the Engineer will determine acceptability and payment adjustments.

Establish the strength–maturity relationship in accordance with Tex-426-A when the maturity method is specified or permitted. When using the maturity method, any changes in any of the ingredients, including changes in proportions, will require the development of a new strength–maturity relationship for the mix.

4.3.3. **Mix Design of Record**. Once a trial batch or previously satisfactory field data substantiates the mix design, the proportions and mixing methods used become the mix design of record. Do not exceed mix design water-to-cementitious material ratio.

4.4. **Production Testing**.

4.4.1. **Aggregate Moisture Testing**. Determine moisture content per Tex-409-A or Tex-425-A for coarse, intermediate, and fine aggregates at least twice a week, when there is an apparent change, or for new shipments of aggregate. When aggregate hoppers or storage bins are equipped with properly maintained electronic moisture probes for continuous moisture determination, moisture tests per Tex-409-A or Tex-425-A are not required. Electronic moisture probes, however, must be verified at least every 90 days against Tex-409-A and be accurate to within 1.0% of the actual moisture content.

When producing SCC, and when aggregate hoppers or storage bins are not equipped with electric moisture probes, determine the moisture content of the aggregates before producing the first concrete batch each day. Thereafter, determine the moisture content every 4 hr. or when there is an apparent change while SCC is being produced.

4.4.2. **Aggregate Gradation Testing**. Perform a sieve analysis in accordance with Tex-401-A on each stockpile used in the blend at least one day before producing OAG concrete when producing optimized aggregate gradation concrete. Perform sieve analysis on each stockpile after every 10,000 cubic yards of OAG concrete produced. Provide sieve analysis data to the Engineer.

4.5. **Measurement of Materials**.

4.5.1. **Non-Volumetric Mixers**. Measure aggregates by weight. Correct batch weight measurements for aggregate moisture content. Measure mixing water, consisting of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures, by volume or weight. Measure ice by weight. Measure cement and supplementary cementing materials in a hopper and on a separate scale from those used for other materials. Measure the cement first when measuring the cumulative weight. Measure concrete chemical admixtures by weight or volume. Measure batch materials within the tolerances of Table 12.

Table 12
Mix Design Batching Tolerances—Non-Volumetric Mixers

Material	Tolerance (%)
Cement, wt.	-1 to +3
SCM, wt.	-1 to +3
Cement + SCM (cumulative weighing), wt.	-1 to +3
Water, wt. or volume	±3[1]
Fine aggregate, wt.	±2
Coarse aggregate, wt.	±2
Fine + coarse aggregate (cumulative weighing), wt.	±1
Chemical admixtures, wt. or volume	±3

1. Allowable deviation from target weight not including water withheld or moisture in the aggregate. The Engineer will verify the water-to-cementitious material ratio is within specified limits.

Ensure the quantity measured, when measuring cementitious materials at less than 30% of scale capacity, is accurate to not less than the required amount and not more than 4% in excess. Ensure the cumulative quantity, when measuring aggregates in a cumulative weigh batcher at less than 30% of the scale capacity,

is measured accurate to ±0.3% of scale capacity or ±3% of the required cumulative weight, whichever is less.

Measure cement in number of bags under special circumstances when approved. Use the weights listed on the packaging. Weighing bags of cement is not required. Ensure fractional bags are not used except for small hand-mixed batches of approximately 5 cu. ft. or less and when an approved method of volumetric or weight measurement is used.

4.5.2. **Volumetric Mixers**. Provide an accurate method of measuring all ingredients by volume, and calibrate equipment to assure correct measurement of materials within the specified tolerances. Base tolerances on volume–weight relationship established by calibration, and measure the various ingredients within the tolerances of Table 13. Correct batch measurements for aggregate moisture content.

Table 13
Mix Design Batching Tolerances—Volumetric Mixers

Material	Tolerance
Cement, wt. %	0 to +4
SCM, wt. %	0 to +4
Fine aggregate, wt. %	±2
Coarse aggregate, wt. %	±2
Admixtures, wt. or volume %	±3
Water, wt. or volume %	±1

4.6. **Mixing and Delivering Concrete**.

4.6.1. **Mixing Concrete**. Operate mixers and agitators within the limits of the rated capacity and speed of rotation for mixing and agitation as designated by the manufacturer of the equipment. Provide concrete in a thoroughly mixed and uniform mass with a satisfactory degree of uniformity when tested in accordance with Tex-472-A.

Do not top-load new concrete onto returned concrete.

Adjust mixing times and batching operations as necessary when the concrete contains silica fume to ensure the material is completely and uniformly dispersed in the mix. The dispersion of the silica fume within the mix will be verified by the Construction Division, Materials and Pavements Section, using cylinders made from trial batches. Make necessary changes to the batching operations, if uniform dispersion is not achieved, until uniform and complete dispersion of the silica fume is achieved.

Mix concrete by hand methods or in a small motor-driven mixer when permitted, for small placements of less than 2 cu. yd. For such placements, proportion the mix by volume or weight.

4.6.2. **Delivering Concrete**. Deliver concrete to the project in a thoroughly mixed and uniform mass, and discharge the concrete with a satisfactory degree of uniformity. Conduct testing in accordance with Tex-472-A when there is a reason to suspect the uniformity of concrete and as directed.

Maintain concrete delivery and placement rates sufficient to prevent cold joints.

Adding chemical admixtures or the portion of water withheld is only permitted at the jobsite, under the supervision of the Engineer, to adjust the slump or slump flow of the concrete. Do not add water or chemical admixtures to the batch after more than an amount needed to conduct slump testing has been discharged. Turn the drum or blades at least 30 additional revolutions at mixing speed to ensure thorough and uniform mixing of the concrete. When this water is added, do not exceed the approved mix design water-to-cementitious material ratio.

Before unloading, furnish the delivery ticket for the batch of concrete containing the information required on Department Form 596, “Concrete Batch Ticket.” The Engineer will verify all required information is provided on the delivery tickets. The Engineer may suspend concrete operations until the corrective actions are

implemented if delivery tickets do not provide the required information. The Engineer will verify the design water-to-cementitious material ratio is not exceeded.

Begin the discharge of concrete delivered in truck mixers within the times listed in Table 14. Concrete may be discharged after these times provided the concrete temperature and slump meet the requirements listed in this Item and other pertinent Items. Perform these tests with certified testing personnel per Section 421.4.8.1., "Certification of Testing Personnel." Provide the Engineer the option of witnessing testing of the concrete. If not provided this option, the Engineer may require additional testing before the concrete is placed.

Table 14
Concrete Discharge Times

Fresh Concrete Temperature, °F	Max Time After Batching for Concrete Not Containing Type B or D Admixtures, min.	Max Time After Batching for Concrete Containing Type B or D Admixtures,[1] min.
90 and above	45	75
75 ≤ T < 90	60	90
T < 75	90	120

1. Concrete must contain at least the minimum manufacturer's recommended dosage of Type B or D admixture.

4.7. **Placing, Finishing, and Curing Concrete**. Place, finish, and cure concrete in accordance with the pertinent Items.

4.8. **Sampling and Testing of Concrete**. Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows:

4.8.1. **Certification of Testing Personnel**. Contractor personnel performing testing must be either ACI-certified or qualified by a Department-recognized equivalent written and performance testing program for the tests being performed. Personnel performing these tests are subject to Department approval. Use of a commercial laboratory is permitted at the Contractor's option. All personnel performing testing using the maturity method must be qualified by a training program recognized by the Department before using this method on the job.

4.8.2. **Fresh Concrete**. Provide safe access and assistance to the Engineer during sampling. Fresh concrete will be sampled for testing at the discharge end if using belt conveyors or pumps. When it is impractical to sample at the discharge end, a sample will be taken at the time of discharge from the delivery equipment and correlation testing will be performed and documented to ensure specification requirements are met at the discharge end.

4.8.3. **Testing of Fresh Concrete**. Test for the fresh properties listed in Table 15.

Table 15
Fresh Concrete Tests

Tests	Test Methods
Slump[1]	Tex-415-A
Temperature[1]	Tex-422-A
Air Content[1,2]	Tex-414-A, Tex-416-A, or ASTM C457

1. Job-control testing performed by the Contractor.
2. Only required when air-entrained concrete is specified on the plans.

Concrete with a slump lower than the minimum placement slump in Table 9 after the addition of all water withheld, or concrete exhibiting segregation and excessive bleeding will be rejected.

4.8.3.1. **Job-Control Testing**. Perform job-control testing as specified in Table 16 unless otherwise specified. Provide the Engineer the opportunity to witness the testing. The Engineer may require a retest if not given the opportunity to witness. Immediately notify the Engineer of any nonconformity issues. Furnish a copy of all test results to the Engineer daily.

Table 16
Job-Control Testing Frequencies

Concrete Placements	Frequency
Bridge Deck Placements	Test the first few loads, then every 60 cu. yd. or fraction thereof.
All Other Structural Class Concrete Placements	One test every 60 cu. yd. or fraction thereof per class per day.
Non-Structural Class Concrete Placements	One test every 180 cu. yd. or fraction thereof.

Immediately resample and retest the concrete slump when the concrete exceeds the slump range at time of placement. If the concrete exceeds the slump range after the retest, and is used at the Contractor's option, the Engineer will make strength specimens as specified in Article 421.5., "Acceptance of Concrete."

4.8.3.2. **Strength Specimen Handling**. Remove specimens from their molds and deliver Department test specimens to curing facilities within 24 to 48 hr. after molding, in accordance with pertinent test procedures unless otherwise shown on the plans or directed. Clean and prepare molds for reuse if necessary.

5. ACCEPTANCE OF CONCRETE

The Engineer will sample and test the fresh and hardened concrete for acceptance. The test results will be reported to the Contractor and the concrete supplier. Investigate the quality of the materials, the concrete production operations, and other possible problem areas to determine the cause for any concrete that fails to meet the required strengths as outlined below. Take necessary actions to correct the problem including redesign of the concrete mix. The Engineer may suspend all concrete operations under the pertinent Items if the Contractor is unable to identify, document, and correct the cause of the low strengths in a timely manner. Resume concrete operations only after obtaining approval for any proposed corrective actions. Concrete failing to meet the required strength as outlined below will be evaluated using the procedures listed in Article 421.6., "Measurement and Payment."

5.1. **Structural Class of Concrete**. For concrete classes identified as structural concrete in Table 8, the Engineer will make and test 7-day and 28-day specimens. Acceptance will be based on attaining the design strength given in Table 8.

5.2. **Class P and Class HES**. The Engineer will base acceptance in accordance with Item 360, "Concrete Pavement," and Item 361, "Repair of Concrete Pavement."

5.3. **All Other Classes of Concrete**. For concrete classes not identified as structural concrete in Table 8, the Engineer will make and test 7-day specimens. The Engineer will base acceptance on the 7-day target value established in accordance with Section 421.4.3., "Concrete Trial Batches."

6. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be subsidiary to pertinent Items.

The following procedure will be used to evaluate concrete where one or more project acceptance test specimens fail to meet the required design strength specified in this Item or on the plans:

- The concrete for a given placement will be considered structurally adequate and accepted at full price if the average of all test results for specimens made at the time of placement meets the required design strength provided no single test result is less than 85% of the required design strength.
- The Engineer will perform a structural review of the concrete to determine its adequacy to remain in service if the average of all test results for specimens made at the time of placement is less than the required design strength or if any test results are less than 85% of the required design strength. If the in-situ concrete strength is needed for the structural review, take cores at locations designated by the

Engineer in accordance with Tex-424-A. The Engineer will test the cores. The coring and testing will be at the Contractor's expense.

- If all of the tested cores meet the required design strength, the concrete will be paid for at full price.
- If any of the tested cores do not meet the required design strength, but the average strength attained is determined to be structurally adequate, the Engineer will determine the limits of the payment adjustment using the following formula:

$$A = B_p\left[-5.37\left(\frac{S_a}{S_s}\right)^2 + 11.69\left(\frac{S_a}{S_s}\right) - 5.32\right]$$

where:
A = Amount to be paid per unit of measure for the entire placement in question
S_a = Actual average strength from cylinders or cores. Use values from cores, if taken.
S_s = Minimum required strength (specified)
B_p = Unit Bid Price

- If the structural review determines the concrete is not adequate to remain in service, the Engineer will determine the limits of the concrete to be removed.
- The decision to reject structurally inadequate concrete or to apply the payment adjustment factor will be made no later than 56 days after placement.

Item 432
Riprap

1. DESCRIPTION

Furnish and place concrete, stone, cement-stabilized, or special riprap.

2. MATERIALS

Furnish materials in accordance with the following Items.

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 431, "Pneumatically Placed Concrete,"
- Item 440, "Reinforcement for Concrete," and
- DMS-6200, "Filter Fabric."

2.1. **Concrete Riprap**. Use Class B Concrete unless otherwise shown on the plans.

2.2. **Pneumatically Placed Concrete Riprap**. Use Class II concrete that meets Item 431, "Pneumatically Placed Concrete," unless otherwise shown on the plans.

2.3. **Stone Riprap**. Use durable natural stone with a bulk specific gravity of at least 2.50 as determined by Tex-403-A unless otherwise shown on the plans. Provide stone that, when tested in accordance with Tex-411-A, has weight loss of no more than 18% after 5 cycles of magnesium sulfate solution.

Perform a size verification test on the first 5,000 sq. yd. of finished riprap stone for all types of stone riprap at a location determined by the Engineer. Test the riprap stone in accordance with ASTM D5519. Additional tests may be required. Do not place additional riprap until the initial 5,000 sq. yd. of riprap has been approved.

Provide grout or mortar in accordance with Item 421, "Hydraulic Cement Concrete," when specified. Provide grout with a consistency that will flow into and fill all voids.

Provide filter fabric in accordance with DMS-6200, "Filter Fabric." Provide Type 2 filter fabric for protection stone riprap unless otherwise shown on the plans. Provide Type 2 filter fabric for Type R, F, or Common stone riprap when shown on the plans.

2.3.1. **Type R**. Use stones between 50 and 250 lb. with at least 50% of the stones heavier than 100 lb.

2.3.2. **Type F**. Use stones between 50 and 250 lb. with at least 40% of the stones heavier than 100 lb. Use stones with at least 1 broad flat surface.

2.3.3. **Common**. Use stones between 50 and 250 lb. Use stones that are at least 3 in. in their least dimension. Use stones that are at least twice as wide as they are thick. When shown on the plans or approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken concrete.

2.3.4. **Protection**. Use boulders or quarried rock that meets the gradation requirements of Table 1. Both the width and the thickness of each piece of riprap must be at least 1/3 of the length. When shown on the plans or as approved, material may consist of broken concrete removed under the Contract or from other approved sources. Cut exposed reinforcement flush with all surfaces before placement of each piece of broken

concrete. Determine gradation of the finished, in-place, riprap stone under the direct supervision of the Engineer in accordance with ASTM D5519.

Table 1
In-Place Protection Riprap Gradation Requirements

Size	Maximum Size (lb.)	90% Size[1] (lb.)	50% Size[2] (lb.)	8% Size[3] Minimum (lb.)
12 in.	200	80–180	30–75	3
15 in.	320	170–300	60–165	20
18 in.	530	290–475	105–220	22
21 in.	800	460–720	175–300	25
24 in.	1,000	550–850	200–325	30
30 in.	2,600	1,150–2,250	400–900	40

1. Defined as that size such that 10% of the total riprap stone, by weight, is larger and 90% is smaller.
2. Defined as that size such that 50% of the total riprap stone, by weight, is larger and 50% is smaller.
3. Defined as that size such that 92% of the total riprap stone, by weight, is larger and 8% is smaller.

The Engineer may require in-place verification of the stone size. Determine the in-place size of the riprap stone by taking linear transects along the riprap and measuring the intermediate axis of the stone at select intervals. Place a tape measure along the riprap and determine the intermediate axis size of the stone at 2 ft. intervals. Measure a minimum of 100 stones, either in a single transect or in multiple transects, then follow ASTM D5519 Test Procedure Part B to determine the gradation. Table 2 is a guide for comparing the stone size in inches to the stone weight shown in Table 1.

Table 2
Protection Riprap Stone Size[1]

Size	Dmax (in.)	D90 (in.)	D50 (in.)	D8 (in.)
12 in.	13.76	10.14–13.29	7.31–9.92	3.39
15 in.	16.10	13.04–15.75	9.21–12.91	6.39
18 in.	19.04	15.58–18.36	11.10–14.21	6.59
21 in.	21.85	18.17–21.09	13.16–15.75	6.88
24 in.	23.53	19.28–22.29	13.76–16.18	7.31
30 in.	32.36	24.65–30.84	17.34–22.72	8.05

1. Based on a Specific Gravity of 2.5 and using the following equation for the intermediate axis diameter $D = \{(12*W)/(Gs*62.4*0.85)\}^{1/3}$

   where:
   D = intermediate axis diameter in in.;
   W = weight of stone in lbs.;
   Gs = Specific Gravity of stone.
   Note—If the Specific Gravity of the stone is different than 2.5, then the above equation can be used to determine the appropriate size using the actual Specific Gravity.

If required, provide bedding stone that, in-place, meets the gradation requirements shown in Table 3 or as otherwise shown on the plans. Determine the size distribution in Table 3 in accordance with ASTM D6913.

Table 3
Protection Riprap Bedding Material Gradation Requirements

Sieve Size (Sq. Mesh)	% by Weight Passing
3"	100
1-1/2"	50–80
3/4"	20–60
#4	0–15
#10	0–5

2.4. **Cement-Stabilized Riprap**. Provide aggregate that meets Item 247, "Flexible Base," for the type and grade shown on the plans. Use cement-stabilized riprap with 7% hydraulic cement by dry weight of the aggregate.

2.5. **Special Riprap**. Furnish materials for special riprap according to the plans.

3. CONSTRUCTION

Dress slopes and protected areas to the line and grade shown on the plans before the placement of riprap. Place riprap and toe walls according to details and dimensions shown on the plans or as directed.

3.1. **Concrete Riprap**. Reinforce concrete riprap with 6 × 6 – W2.9 × W2.9 welded wire fabric or with No. 3 or No. 4 reinforcing bars spaced at a maximum of 18 in. in each direction unless otherwise shown. Alternative styles of welded wire fabric that provide at least 0.058 sq. in. of steel per foot in both directions may be used if approved. A combination of welded wire fabric and reinforcing bars may be provided when both are permitted. Provide a minimum 6-in. lap at all splices. Provide horizontal cover of at least 1 in. and no more than 3 in. at the edge of the riprap. Place the first parallel bar no more than 6 in. from the edge of concrete. Use approved supports to hold the reinforcement approximately equidistant from the top and bottom surface of the slab. Adjust reinforcement during concrete placement to maintain correct position.

Sprinkle or sprinkle and consolidate the subgrade before the concrete is placed as directed. All surfaces must be moist when concrete is placed.

Compact and shape the concrete once it has been placed to conform to the dimensions shown on the plans. Finish the surface with a wood float after it has set sufficiently to avoid slumping to secure a smooth surface or broom finish as approved.

Cure the riprap immediately after the finishing operation according to Item 420, “Concrete Substructures.”

3.2. **Stone Riprap**. Provide the following types of stone riprap when shown on the plans:

- **Dry Riprap**. Stone riprap with voids filled with only spalls or small stones.
- **Grouted Riprap**. Type R, F, or Common stone riprap with voids grouted after all the stones are in place.
- **Mortared Riprap**. Type F stone riprap laid and mortared as each stone is placed.

Use spalls and small stones lighter than 25 lb. to fill open joints and voids in stone riprap, and place to a tight fit.

Place mortar or grout only when the air temperature is above 35°F. Protect work from rapid drying for at least 3 days after placement.

Place filter fabric with the length running up and down the slope unless otherwise approved. Ensure fabric has a minimum overlap of 2 ft. Secure fabric with nails or pins. Use nails at least 2 in. long with washers or U-shaped pins with legs at least 9 in. long. Space nails or pins at a maximum of 10 ft. in each direction and 5 ft. along the seams. Alternative anchorage and spacing may be used when approved.

3.2.1. **Type R**. Construct riprap as shown in Figure 1 on the *Stone Riprap Standard* and as shown on the plans. Place stones in a single layer with close joints so most of their weight is carried by the earth and not the adjacent stones. Place the upright axis of the stones at an angle of approximately 90° to the embankment slope. Place each course from the bottom of the embankment upward with the larger stones in the lower courses.

Fill open joints between stones with spalls. Place stones to create a uniform finished top surface. Do not exceed a 6-in. variation between the tops of adjacent stones. Replace, embed deeper, or chip away stones that project more than the allowable amount above the finished surface.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require Type R stone riprap to be grouted. Wet the stones thoroughly after they are in place, fill the spaces between the stones with grout, and pack. Sweep the surface of the riprap with a stiff broom after grouting.

3.2.2. **Type F**.

3.2.2.1. **Dry Placement**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Set the flat surface on a prepared horizontal earth bed, and overlap the underlying course to secure a lapped surface. Place the large stones first, roughly arranged in close contact. Fill the spaces between the large stones with suitably sized stones placed to leave the surface evenly stepped and conforming to the contour required. Place stone to drain water down the face of the slope.

3.2.2.2. **Grouting**. Construct riprap as shown in Figure 3 on the *Stone Riprap Standard*. Size, shape, and lay large flat-surfaced stones to produce an even surface with minimal voids. Place stones with the flat surface facing upward parallel to the slope. Place the largest stones near the base of the slope. Fill spaces between the larger stones with stones of suitable size, leaving the surface smooth, tight, and conforming to the contour required. Place the stones to create a plane surface with a variation no more than 6 in. in 10 ft. from true plane. Provide the same degree of accuracy for warped and curved surfaces. Prevent earth, sand, or foreign material from filling the spaces between the stones. Wet the stones thoroughly after they are in place, fill the spaces between them with grout, and pack. Sweep the surface with a stiff broom after grouting.

3.2.2.3. **Mortaring**. Construct riprap as shown in Figure 2 on the *Stone Riprap Standard*. Lap courses as described for dry placement. Wet the stones thoroughly before placing mortar. Bed the larger stones in fresh mortar as they are being place and shove adjacent stones into contact with one another. Spread excess mortar forced out during placement of the stones uniformly over them to fill all voids completely. Point up all joints roughly either with flush joints or shallow, smooth-raked joints as directed.

3.2.3. **Common**. Construct riprap as shown in Figure 4 on the *Stone Riprap Standard*. Place stones on a bed excavated for the base course. Bed the base course of stone well into the ground with the edges in contact. Bed and place each succeeding course in even contact with the preceding course. Use spalls and small stones to fill any open joints and voids in the riprap. Ensure the finished surface presents an even, tight surface, true to the line and grades of the typical sections.

Prevent earth, sand, or foreign material from filling the spaces between the stones when the plans require grouting common stone riprap. Wet the stones thoroughly after they are in place; fill the spaces between them with grout; and pack. Sweep the surface with a stiff broom after grouting.

3.2.4. **Protection**. Construct riprap as shown in Figure 5 on the *Stone Riprap Standard*. Place riprap stone on the slopes within the limits shown on the plans. Place stone for riprap on the filter fabric to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids. Construct the riprap to the lines and grades shown on the plans or staked in the field. A tolerance of +6 in. and −0 in. from the slope line and grades shown on the plans is allowed in the finished surface of the riprap. Place riprap to its full thickness in a single operation. Avoid displacing the filter fabric. Ensure the entire mass of stones in their final position is free from objectionable pockets of small stones and clusters of larger stones. Do not place riprap in layers, and do not place it by dumping it into chutes, dumping it from the top of the slope, pushing it from the top of the slope, or any method likely to cause segregation of the various sizes. Obtain the desired distribution of the various sizes of stones throughout the mass by selective loading of material at the quarry or other source or by other methods of placement that will produce the specified results. Rearrange individual stones by mechanical equipment or by hand if necessary to obtain a reasonably well-graded distribution of stone sizes. Use the bedding thickness shown and place stone for riprap on the bedding material to produce a reasonably well-graded mass of riprap with the minimum practicable percentage of voids if required on the plans.

3.3. **Pneumatically Placed Concrete Riprap, Class II**. Meet Item 431, “Pneumatically Placed Concrete.” Provide reinforcement following the details on the plans and Item 440, “Reinforcement for Concrete.” Support reinforcement with approved supports throughout placement of concrete.

Give the surface a wood-float finish or a gun finish as directed. Cure the riprap with membrane-curing compound immediately after the finishing operation in accordance with Item 420, “Concrete Substructures.”

3.4. **Cement-Stabilized Riprap**. Follow the requirements of the plans and the provisions for concrete riprap except when reinforcement is not required. The Engineer will approve the design and mixing of the cement-stabilized riprap.

3.5. **Special Riprap**. Construct special riprap according to the plans.

4. MEASUREMENT

This Item will be measured by the cubic yard of material complete in place. Volume will be computed on the basis of the measured area in place and the thickness and toe wall width shown on the plans.

If required on the plans, the pay quantity of the bedding material for stone riprap for protection to be paid for will be measured by the cubic yard as computed from the measured area in place and the bedding thickness shown on the plans.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Riprap" of the type, thickness, and void-filling technique (Dry, Grout, Mortar) specified, as applicable. This price is full compensation for furnishing, hauling, and placing riprap and for filter fabric, expansion joint material, concrete and reinforcing steel, grout and mortar, scales, test weights, equipment, labor, tools, and incidentals.

Payment for excavation of toe wall trenches, for all necessary excavation below natural ground or bottom of excavated channel, and for shaping of slopes for riprap will be included in the unit price bid per cubic yard of riprap.

When bedding is required for protection stone riprap, payment will be made at the unit price for "Bedding Material" of the thickness specified. This price is full compensation for furnishing, hauling, placing, and maintaining the bedding material until placement of the riprap cover is completed and accepted; excavation required for placement of bedding material; and equipment, scales, test weights, labor, tools, and incidentals. No payment will be made for excess thickness of bedding nor for material required to replace embankment material lost by rain wash, wind erosion, or otherwise.

Item 440
Reinforcement for Concrete

1. DESCRIPTION

Furnish and place reinforcement of the type, size, and details shown on the plans.

2. MATERIALS

Use deformed steel bar reinforcement unless otherwise specified or allowed.

2.1. **Approved Mills**. Before furnishing steel, producing mills of reinforcing steel for the Department must be pre-approved in accordance with DMS-7320, "Qualification Procedure for Reinforcing Steel Producing Mills," by the Construction Division. The Department's MPL has a list of approved producing mills. Reinforcing steel obtained from unapproved sources will not be accepted.

Contact the Construction Division with the name and location of the producing mill for stainless reinforcing steel, low carbon/chromium reinforcing steel, or dual-coated reinforcing steel at least 4 weeks before ordering any material.

2.2. **Deformed Steel Bar Reinforcement**. Provide deformed reinforcing steel conforming to one of the following:

- ASTM A615, Grades 60, 75, or 80;
- ASTM A996, Type A, Grade 60;
- ASTM A996, Type R, Grade 60, permitted in concrete pavement only (Furnish ASTM A996, Type R bars as straight bars only and do not bend them. Bend tests are not required.); or
- ASTM A706, Grades 60 or 80.

Provide the grade of reinforcing steel shown on the plans. Provide Grade 60 if no grade is shown.

The nominal size, area, and weight of reinforcing steel bars this Item covers are shown in Table 1.

Table 1
Size, Area, and Weight of Reinforcing Steel Bars

Bar Size Number	Diameter (in.)	Area (sq. in.)	Weight per Foot (lbs.)
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.650
18	2.257	4.00	13.60

2.3. **Smooth Steel Bar Reinforcement**. Provide smooth bars for concrete pavement with a yield strength of at least 60 ksi and meeting ASTM A615. Provide steel conforming to ASTM A615 or meet the physical requirements of ASTM A36 for smooth bars that are larger than No. 3. Designate smooth bars by size number up to No. 4 and by diameter in inches above No. 4.

2.4. **Spiral Reinforcement**. Provide bars or wire for spiral reinforcement of the grade and minimum size or gauge shown on the plans.

Provide smooth or deformed wire conforming to ASTM A1064. Provide bars conforming to ASTM A615; ASTM A996, Type A; or ASTM A675, Grade 80, meeting dimensional requirements of ASTM A615.

2.5. **Weldable Reinforcing Steel**. Provide reinforcing steel conforming to ASTM A706 or with a maximum carbon equivalent (C.E.) of 0.55% if welding of reinforcing steel is required or desired. Provide a report showing the percentages of elements necessary to establish C.E. for reinforcing steel that does not meet ASTM A706, in order to be structurally welded. These requirements do not pertain to miscellaneous welds on reinforcing steel as defined in Section 448.4.2.1.1., "Miscellaneous Welding Applications."

Calculate C.E. using the following formula:

$$C.E. = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} - \frac{\%Mo}{50} - \frac{\%V}{10}$$

Do not weld stainless reinforcing steel without permission from the Engineer. Provide stainless reinforcing steel suitable for welding, if required, and submit welding procedures and electrodes to the Engineer for approval.

2.6. **Welded Wire Reinforcement**. Provide welded wire reinforcement (WWR) conforming to ASTM A1064. Observe the relations shown in Table 2 among size number, diameter in inches, and area when ordering wire by size numbers, unless otherwise specified. Precede the size number for deformed wire with "D" and for smooth wire with "W."

Designate WWR as shown in the following example: 6 × 12 – W16 × W8 (indicating 6-in. longitudinal wire spacing and 12-in. transverse wire spacing with smooth No. 16 wire longitudinally and smooth No. 8 wire transversely).

Table 2
Wire Size Number, Diameter, and Area

Size Number (in.)	Diameter (in.)	Area (sq. in.)
31	0.628	0.310
30	0.618	0.300
28	0.597	0.280
26	0.575	0.260
24	0.553	0.240
22	0.529	0.220
20	0.505	0.200
18	0.479	0.180
16	0.451	0.160
14	0.422	0.140
12	0.391	0.120
10	0.357	0.100
8	0.319	0.080
7	0.299	0.070
6	0.276	0.060
5.5	0.265	0.055
5	0.252	0.050
4.5	0.239	0.045
4	0.226	0.040
3.5	0.211	0.035
2.9	0.192	0.035
2.5	0.178	0.025
2	0.160	0.020
1.4	0.134	0.014
1.2	0.124	0.012
0.5	0.080	0.005

Note—Size numbers (in.) are the nominal cross-sectional area of the wire in hundredths of a square inch. Fractional sizes between the sizes listed above are also available and acceptable for use.

2.7. **Epoxy Coating**. Provide epoxy coated reinforcing steel as shown on the plans. Before furnishing epoxy coated reinforcing steel, an epoxy applicator must be pre-approved in accordance with DMS-7330, "Qualification Procedure for Reinforcing Steel Epoxy Coating Applicators." The Department's MPL has a list of approved applicators.

Furnish coated reinforcing steel meeting the requirements in Table 3.

Table 3
Epoxy Coating Requirements for Reinforcing Steel

Material	Specification
Bar	ASTM A775 or A934
Wire or WWR	ASTM A884 Class A or B
Mechanical couplers	As shown on the plans
Hardware	As shown on the plans

Use epoxy coating material and coating repair material that complies with DMS-8130, "Epoxy Powder Coating for Reinforcing Steel." Patch no more than 1/4-in. total length in any foot at the applicator's plant.

Maintain identification of all reinforcing steel throughout the coating and fabrication process and until delivery to the project site.

Furnish 1 copy of a written certification verifying the coated reinforcing steel meets the requirements of this Item and 1 copy of the manufacturer's control tests.

2.8. **Mechanical Couplers**. Use couplers of the type specified in DMS-4510, "Mechanical Couplers for Reinforcing Steel," Article 4510.5.A, "General Requirements," when mechanical splices in reinforcing steel bars are shown on the plans.

Furnish only couplers pre-qualified in accordance with DMS-4510, "Mechanical Couplers for Reinforcing Steel." Ensure sleeve-wedge type couplers are not used on coated reinforcing. Sample and test couplers for use on individual projects in accordance with DMS-4510, "Mechanical Couplers for Reinforcing Steel." Furnish couplers only at locations shown on the plans.

Furnish couplers for stainless reinforcing steel with the same alloy designation as the reinforcing steel.

2.9. **Fibers**. Supply fibers conforming to DMS-4550 "Fibers for Concrete" at the minimum dosage listed in the Department's MPL, when allowed by the plans. Use non-metallic fibers when shown on the plans.

2.10. **Stainless Reinforcing Steel**. Provide deformed steel bars of the types listed in Table 4 and conforming to ASTM A955, Grade 60 or higher when stainless reinforcing steel is required on the plans.

Table 4
Acceptable Types of Deformed Stainless Steel Bar

UNS Designation	S31653	S31803	S24100	S32304
AISI Type	316LN	2205	XM-28	2304

2.11. **Low Carbon/Chromium Reinforcing Steel**. Provide deformed steel bars conforming to ASTM A1035, Grade 100 when low carbon/chromium reinforcing steel is required on the plans.

2.12. **Dual-Coated Reinforcing Steel**. Provide deformed bars conforming to ASTM A1055, Grade 60 or higher when dual-coated reinforcing steel is required on the plans.

2.13. **Glass Fiber Reinforced Polymer Bars (GFRP)**. Provide bars conforming to the AASHTO LRFD *Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings*, Section 4, "Material Specifications" when GFRP bars are required on the plans. Provide sample certification demonstrating the GFRP bar supplier has produced bar that meets the Material Specifications 2 mo. before fabrication. Furnish certification upon shipment that the GFRP bar supplied meets the Material Specifications.

3. CONSTRUCTION

3.1. **Bending**. Fabricate reinforcing steel bars as prescribed in the CRSI *Manual of Standard Practice* to the shapes and dimensions shown on the plans. Fabricate in the shop if possible. Field-fabricate, if permitted, using a method approved by the Engineer. Replace improperly fabricated, damaged, or broken bars at no additional expense to the Department. Repair damaged or broken bars embedded in a previous concrete placement using a method approved by the Engineer.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), must be as shown in Table 5.

Table 5
Minimum Inside Diameter of Bar Bends

Bend	Bar Size Number (in.)	Pin Diameter
Bends of 90° and greater in stirrups, ties, and other secondary bars that enclose another bar in the bend	3, 4, 5	4d
	6, 7, 8	6d
Bends in main bars and in secondary bars not covered above	3 through 8	6d
	9, 10, 11	8d
	14, 18	10d

Bend-test representative specimens as described for smaller bars in the applicable ASTM specification where bending No. 14 or No. 18 Grade 60 bars is required. Make the required 90° bend around a pin with a diameter of 10 times the nominal diameter of the bar.

Bend stainless reinforcing steel in accordance with ASTM A955.

3.2. **Tolerances**. Fabrication tolerances for bars are shown in Figure 1.

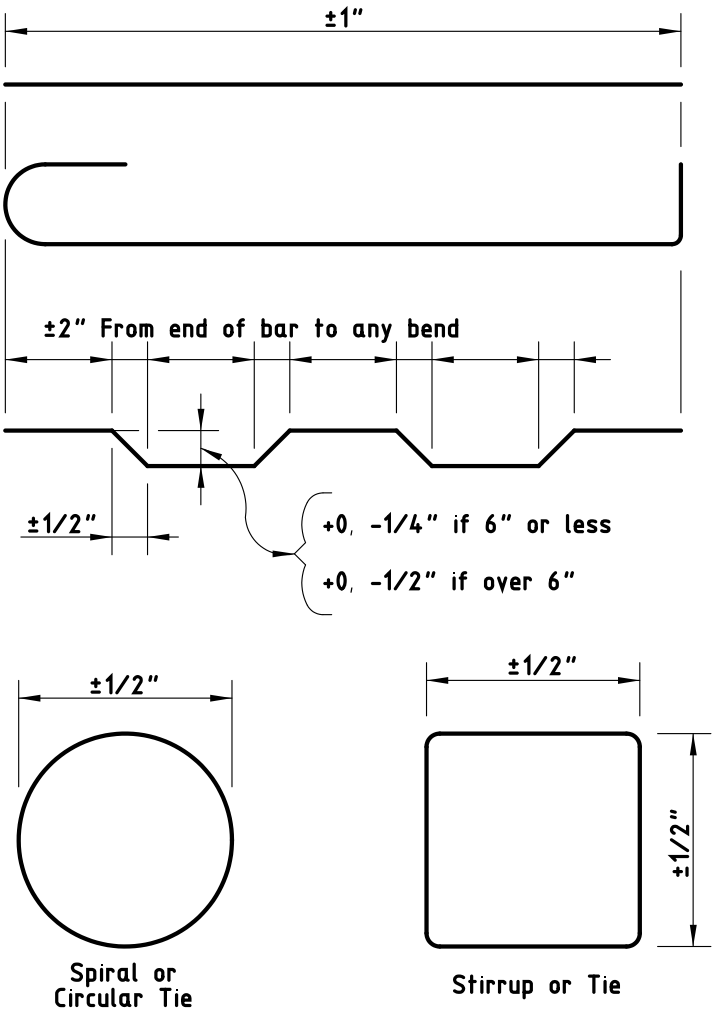


Figure 1
Fabrication Tolerances for Bars

3.3. **Storage**. Store reinforcement above the ground on platforms, skids, or other supports, and protect it from damage and deterioration. Ensure reinforcement is free from dirt, paint, grease, oil, and other foreign materials when it is placed in the work. Use reinforcement free from defects such as cracks and delaminations. Rust, surface seams, surface irregularities, or mill scale will not be cause for rejection if the minimum cross-sectional area of a hand wire-brushed specimen meets the requirements for the size of steel specified.

Do not allow stainless reinforcing steel to be in direct contact with uncoated reinforcing steel, nor with galvanized reinforcing steel. This does not apply to stainless steel wires and ties. Store stainless reinforcing steel separately, off the ground on wooden supports.

3.4. **Splices**. Lap-splice, weld-splice, or mechanically splice bars as shown on the plans. Additional splices not shown on the plans will require approval. Splices not shown on the plans will be permitted in slabs no more than 15 in. in thickness, columns, walls, and parapets.

- Do not splice bars less than 30 ft. in plan length unless otherwise approved. For bars exceeding 30 ft. in plan length, the distance center-to-center of splices must be at least 30 ft. minus 1 splice length, with no more than 1 individual bar length less than 10 ft. Make lap splices not shown on the plans, but otherwise

permitted, in accordance with Table 6. Maintain the specified concrete cover and spacing at splices, and place the lap-spliced bars in contact, securely tied together.

Table 6
Minimum Lap Requirements for Steel Bar Sizes through No. 11

Bar Size Number (in.)	Uncoated Lap Length	Coated Lap Length
3	1 ft. 4 in.	2 ft. 0 in.
4	1 ft. 9 in.	2 ft. 8 in.
5	2 ft. 2 in.	3 ft. 3 in.
6	2 ft. 7 in.	3 ft. 11 in.
7	3 ft. 5 in.	5 ft. 2 in.
8	4 ft. 6 in.	6 ft. 9 in.
9	5 ft. 8 in.	8 ft. 6 in.
10	7 ft. 3 in.	10 ft. 11 in.
11	8 ft. 11 in.	13 ft. 5 in.

- Do not lap No. 14 or No. 18 bars.
- Lap spiral steel at least 1 turn.
- Splice WWR using a lap length that includes the overlap of at least 2 cross wires plus 2 in. on each sheet or roll. Splices using bars that develop equivalent strength and are lapped in accordance with Table 6 are permitted.
- Lap the existing longitudinal bars with the new bars as shown in Table 6 for box culvert extensions with less than 1 ft. of fill. Lap at least 1 ft. 0 in. for extensions with more than 1 ft. of fill.
- Ensure welded splices conform to the requirements of the plans and of Item 448, "Structural Field Welding." Field-prepare ends of reinforcing bars if they will be butt-welded. Delivered bars must be long enough to permit weld preparation.
- Install mechanical coupling devices in accordance with the manufacturer's recommendations at locations shown on the plans. Protect threaded male or female connections, and ensure the threaded connections are clean when making the connection. Do not repair damaged threads.
- Mechanical coupler alternate equivalent strength arrangements, to be accomplished by substituting larger bar sizes or more bars, will be considered if approved in writing before fabrication of the systems.

3.5. **Placing**. Place reinforcement as near as possible to the position shown on the plans. Do not vary bars from plan placement by more than 1/12 of the spacing between bars in the plane of the bar parallel to the nearest surface of concrete. Do not vary bars from plan placement by more than 1/4 in in the plane of the bar perpendicular to the nearest surface of concrete. Provide a minimum 1-in. clear cover of concrete to the nearest surface of bar unless otherwise shown on the plans.

For bridge slabs, the clear cover tolerance for the top mat of reinforcement is −0, +1/2 in.

Locate the reinforcement accurately in the forms, and hold it firmly in place before and during concrete placement by means of bar supports that are adequate in strength and number to prevent displacement and keep the reinforcement at the proper distance from the forms. Provide bar supports in accordance with the CRSI *Manual of Standard Practice*. Use Class 1 supports, approved plastic bar supports, precast mortar, or concrete blocks when supports are in contact with removable or stay-in-place forms. Use Class 3 supports in slab overlays on concrete panels or on existing concrete slabs. Bar supports in contact with soil or subgrade must be approved.

Use Class 1A supports with epoxy coated reinforcing steel. Provide epoxy or plastic coated tie wires and clips for use with epoxy coated reinforcing steel.

Use mortar or concrete with a minimum compressive strength of 5,000 psi for precast bar supports. Provide a suitable tie wire in each block for anchoring to the bar.

Place individual bar supports in rows at 4-ft. maximum spacing in each direction. Place continuous type bar supports at 4-ft. maximum spacing. Use continuous bar supports with permanent metal deck forms.

The exposure of the ends of longitudinals, stirrups, and spacers used to position the reinforcement in concrete pipe and storm drains is not cause for rejection.

Tie reinforcement for bridge slabs and top slabs of direct traffic culverts at all intersections, except tie only alternate intersections where spacing is less than 1 ft. in each direction. Tie the bars at enough intersections to provide a rigid cage of reinforcement for reinforcement cages for other structural members. Fasten mats of WWR securely at the ends and edges.

Clean mortar, mud, dirt, debris, oil, and other foreign material from the reinforcement before concrete placement. Do not place concrete until authorized.

Stop placement until corrective measures are taken if reinforcement is not adequately supported or tied to resist settlement, reinforcement is floating upward, truss bars are overturning, or movement is detected in any direction during concrete placement.

3.6. **Handling, Placing, and Repairing Epoxy Coated Reinforcing Steel**.

3.6.1. **Handling**. Provide systems for handling coated reinforcing steel with padded contact areas. Pad bundling bands or use suitable banding to prevent damage to the coating. Lift bundles of coated reinforcement with a strongback, spreader bar, multiple supports, or a platform bridge. Transport the bundled reinforcement carefully, and store it on protective cribbing. Do not drop or drag the coated reinforcement.

3.6.2. **Placing**. Do not flame-cut coated reinforcement. Saw or shear-cut only when approved. Coat cut ends as specified in Section 440.3.6.3., “Repairing Coating.”

Do not weld or mechanically couple coated reinforcing steel except where specifically shown on the plans. Remove the epoxy coating at least 6 in. beyond the weld limits before welding and 2 in. beyond the limits of the coupler before assembly. Clean the steel of oil, grease, moisture, dirt, welding contamination (slag or acid residue), and rust to a near-white finish after welding or coupling. Check the existing epoxy for damage. Remove any damaged or loose epoxy back to sound epoxy coating.

Coat the splice area after cleaning with epoxy repair material to a thickness of 7 to 17 mils after curing. Apply a second application of repair material to the bar and coupler interface to ensure complete sealing of the joint.

3.6.3. **Repairing Coating**. Use material that complies with the requirements of this Item and ASTM D3963 for repairing of the coating. Make repairs in accordance with procedures recommended by the manufacturer of the epoxy coating powder. Apply at least the same coating thickness as required for the original coating for areas to be patched. Repair all visible damage to the coating.

Repair sawed and sheared ends, cuts, breaks, and other damage promptly before additional oxidation occurs. Clean areas to be repaired to ensure they are free from surface contaminants. Make repairs in the shop or field as required.

3.7. **Handling and Placing Stainless Reinforcing Steel**. Handle, cut, and place stainless reinforcing steel bar using tools that are not used on carbon steel. Do not use carbon steel tools, chains, slings, etc. when handling stainless steel. Use only nylon or polypropylene slings. Cut stainless steel reinforcing using shears, saws, abrasive cutoff wheels, or torches. Remove any thermal oxidation using pickling paste. Do not field bend stainless steel reinforcing without approval.

Use 16 gauge fully annealed stainless steel tie wire conforming to the material properties listed in Section 440.2.10., “Stainless Reinforcing Steel.” Support all stainless reinforcing steel on solid plastic, stainless steel, or epoxy coated steel chairs. Do not use uncoated carbon steel chairs in contact with stainless reinforcing steel.

3.8. **Bending, Handling, Repairing, and Placing GFRP Bars**. Fabricate, handle, repair, and place GFRP bars in accordance with the AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings, Section 5, Construction Specifications.

4. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be considered subsidiary to pertinent Items.

Item 462
Concrete Box Culverts and Drains

1. DESCRIPTION

Furnish, construct, and install concrete box culverts and drains.

2. MATERIALS

2.1. **General**. Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 440, "Reinforcement for Concrete," and
- Item 464, "Reinforced Concrete Pipe."

Provide cast-in-place or precast, formed or machine-made, box culverts, and drains. Use Class S concrete for top slabs of cast-in-place concrete culverts for culverts with overlay, a 1- to 2-course surface treatment or a top slab that is the final riding surface unless otherwise shown on the plans. Use Class C concrete for the rest of the culvert and for all other cast-in-place boxes. Culverts with fill do not require Class S concrete.

Furnish material for machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.2. **Fabrication**.

2.2.1. **Cast-in-Place**. Meet Item 420, "Concrete Substructures" and Item 422, "Concrete Superstructures."

2.2.2. **Formed Precast**. Meet Item 424, "Precast Concrete Structural Members (Fabrication)."

2.2.3. **Machine-Made Precast**. Machine-made precast box culvert fabrication plants must be approved in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification." The Department's MPL shows approved machine-made precast box culvert plants. Fabricate machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.3. **Testing**.

2.3.1. **Cast-in-Place**. Provide test specimens that meet Item 421, "Hydraulic Cement Concrete."

2.3.2. **Formed Precast**. Make, cure, and test compressive test specimens in accordance with Tex-704-I.

2.3.3. **Machine-Made Precast**. Make, cure, and test compressive test specimens in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.3.4. **Testing Equipment**. The producer must furnish all equipment required for testing concrete for boxes produced in a precasting plant.

2.4. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast boxes. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate

lifting devices based on the size and weight of the box section. Use lifting holes no larger than 3 in. in diameter. Cut no more than 5 in. in any direction of reinforcement per layer for lifting holes.

2.5. **Marking**. Mark precast boxes with the following:

- name or trademark of fabricator and plant location;
- ASTM designation;
- date of manufacture;
- box size;
- minimum and maximum fill heights;
- designated fabricator's approval stamp;
- boxes to be used for jacking and boring (when applicable);
- designation "SR" for boxes meeting sulfate-resistant concrete plan requirements (when applicable); and
- match-marks for proper installation, when required under Section 462.2.6., "Tolerances."

Mark 1 end of each box section, for boxes without lifting holes, on the inside and outside walls to indicate the top or bottom as it will be installed.

Indent markings into the box section or paint them on each box with waterproof paint.

2.6. **Tolerances**. Ensure precast sections meet the permissible variations listed in ASTM C1577 and that the sides of a section at each end do not vary from being perpendicular to the top and bottom by more than 1/2 in. when measured diagonally between opposite interior corners.

Ensure wall and slab thicknesses are not less than shown on the plans except for occasional deficiencies not greater than 3/16 in. or 5%, whichever is greater. If proper jointing is not affected, thicknesses in excess of plan requirements are acceptable.

Deviations from the above tolerances will be acceptable if the sections can be fitted at the plant or jobsite and the joint opening at any point does not exceed 1 in. Use match-marks for proper installation on sections that have been accepted in this manner.

2.6.1. **Boxes for Jacking Operations**. Use boxes for jacking operations as defined in Item 476, "Jacking, Boring, or Tunneling Pipe or Box," meeting the following additional requirements:

- The box ends must be square such that no point deviates more than 3/8 in. from a plane placed on the end of the box that is perpendicular to the box sides, and
- The slab and wall thicknesses must not be less than specified on the plans and must not exceed the specified thickness by more than 1/2 in.

2.7. **Defects and Repair**. Fine cracks on the surface of the member that do not extend to the plane of the nearest reinforcement are acceptable unless the cracks are numerous and extensive. Repair cracks that extend into the plane of the reinforcing steel in an approved manner. Excessive damage, honeycomb, or cracking will be subject to structural review. The Engineer may accept boxes with repairs that are sound, properly finished, and cured in conformance with pertinent specifications. Discontinue further production of precast sections when fine cracks on the surface indicate poor curing practices until corrections are made and proper curing is provided.

Repair machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.8. **Storage and Shipment**. Store precast sections on a level surface. Do not place any load on the sections until design strength is reached and curing is complete. Shipment of sections is permissible when the design strength and curing requirements have been met.

Store and ship machine-made precast boxes in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

3. CONSTRUCTION

3.1. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," except where jacking, boring, or tunneling methods are shown on the plans or permitted. Jack, bore, or tunnel in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Immediate backfilling is permitted for all box structures where joints consist of materials other than mortar. Take precautions in placing and compacting the backfill to avoid any movement of the boxes or damage to the joints. Remove and replace boxes damaged by the Contractor at no expense to the Department.

3.2. **Placement of Boxes**. Place the box sections in conformance with the plans or as directed when precast boxes are used to form multiple barrel structures. Place material to be used between barrels as shown on the plans or as directed. Start the laying of boxes on the bedding at the outlet end and proceed toward the inlet end with the abutting sections properly matched unless otherwise authorized. Fit, match, and lay the boxes to form a smooth, uniform conduit true to the established lines and grades. Lower the box sections into the trench, for trench installations, without damaging the box or disturbing the bedding and the sides of the trench. Carefully clean the ends of the box before it is placed. Prevent the earth or bedding material from entering the box as it is laid. Remove and re-lay, without extra compensation, boxes that are not in alignment or show excessive settlement after laying. Form and place cast-in-place boxes in accordance with Item 420, "Concrete Substructures."

3.3. **Jointing**. Use any of the jointing materials in accordance with the joint requirements specified in Item 464, "Reinforced Concrete Pipe," unless otherwise shown on the plans. Box joints for rubber gasketed material may be substituted for tongue and groove joints, provided they meet the requirements of ASTM C1677 for design of the joints and permissible variations in dimensions.

3.4. **Connections and Stub Ends**. Make connections of boxes to existing boxes, pipes, drains, or drain appurtenances as shown on the plans. Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections. Connect boxes to any required headwalls, wingwalls, safety end treatments or riprap, or other structures as shown on the plans or as directed. Repair any damage to the existing structure resulting from making the connections. Finish stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the box.

Fill lifting holes with mortar or concrete and cure for precast boxes. Precast concrete or mortar plugs may be used.

3.5. **Extending**. Break back and extend existing culverts in accordance with Section 420.4.8 "Extending Existing Substructures," and Section 422.4.5 "Extending Existing Slabs," as applicable.

4. MEASUREMENT

This Item will be measured by the foot. Measurement will be made between the ends of the culvert or drain along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, "Safety End Treatment." Measurement of spurs, branches, or new connection box section will be made from the intersection of the flow line with the outside surface of the structure into which it connects. Where inlets, headwalls, wingwalls, catch basins, manholes, junction chambers, or other structures are included in lines of culverts or drains, the length of box section tying into the structure wall will be included for measurement, but no other portion of the structure length or width will be included.

The measured length of multiple barrel structures will be the sum of the lengths of the barrels.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Concrete Box Culvert” of the size specified. This price is full compensation for constructing, furnishing, and transporting sections; preparation and shaping of the bed; backfill material between box sections; jointing of sections; jointing material; cutting of sections on skew or slope; connections to new or existing structures; breaking back, removing and disposing of portions of the existing structure and replacing portions of the existing structure as required to make connections; concrete and reinforcing steel; and equipment, labor, materials, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, “Trench Excavation Protection,” or Item 403, “Temporary Special Shoring.” Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400, “Excavation and Backfill for Structures.” When jacking, boring, or tunneling is used at the Contractor’s option, payment will be made under this Item. When jacking, boring, or tunneling is required, payment will be made under Item 476, “Jacking, Boring, or Tunneling Pipe or Box.”

Item 464
Reinforced Concrete Pipe

1. DESCRIPTION

Furnish and install reinforced concrete pipe, materials for precast concrete pipe culverts, or precast concrete storm drain mains, laterals, stubs, and inlet leads.

2. MATERIALS

2.1. **Fabrication**. Fabrication plants must be approved by the Construction Division in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification," before furnishing precast reinforced concrete pipe for Department projects. The Department's MPL has a list of approved reinforced concrete pipe plants.

Furnish material and fabricate reinforced concrete pipe in accordance with DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.2. **Design**.

2.2.1. **General**. The class and D-load equivalents are shown in Table 1. Furnish arch pipe in accordance with ASTM C506 and the dimensions shown in Table 2. Furnish horizontal elliptical pipe in accordance with ASTM C507 and the dimensions shown in Table 3. For arch pipe and horizontal elliptical pipe the minimum height of cover required is 1 ft.

Table 1
Circular Pipe
ASTM C76 & ASTM C655

Class	D-Load
I	800
II	1,000
III	1,350
IV	2,000
V	3,000

Table 2
Arch Pipe

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
1	18	13-1/2	22
2	21	15-1/2	26
3	24	18	28-1/2
4	30	22-1/2	36-1/4
5	36	26-5/8	43-3/4
6	42	31-5/16	51-1/8
7	48	36	58-1/2
8	54	40	65
9	60	45	73
10	72	54	88

Table 3
Horizontal Elliptical Pipe

Design Size	Equivalent Diameter (in.)	Rise (in.)	Span (in.)
1	18	14	23
2	24	19	30
3	27	22	34
4	30	24	38
5	33	27	42
6	36	29	45
7	39	32	49
8	42	34	53
9	48	38	60
10	54	43	68

2.2.2. **Jacking, Boring, or Tunneling**. Design pipe for jacking, boring, or tunneling considering the specific installation conditions such as the soil conditions, installation methods, anticipated deflection angles, and jacking stresses. Provide design notes and drawings signed and sealed by a Texas licensed professional engineer when requested.

2.3. **Marking**. Furnish each section of reinforced concrete pipe marked with the following information specified in DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

- class or D-load of pipe,
- ASTM designation,
- date of manufacture,
- pipe size,
- name or trademark of fabricator and plant location,
- designated fabricator's approval stamp,
- pipe to be used for jacking and boring (when applicable), and
- designation "SR" for pipe meeting sulfate-resistant concrete plan requirements (when applicable).

Clearly mark 1 end of each section during the process of manufacture or immediately thereafter for pipe with elliptical reinforcement. Mark the pipe on the inside and outside of opposite walls to show the location of the top or bottom of the pipe as it should be installed unless the external shape of the pipe is such that the correct position of the top and bottom is obvious. Mark the pipe section by indenting or painting with waterproof paint.

2.4. **Inspection**. Provide access for inspection of the finished pipe at the project site before and during installation.

2.5. **Causes for Rejection**. Individual section of pipe may be rejected for any of the conditions stated in the Annex of DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.6. **Repairs**. Make repairs if necessary as stated in the Annex of DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification."

2.7. **Jointing Materials**. Use any of the following materials for the making of joints unless otherwise shown on the plans. Furnish a manufacturer's certificate of compliance for all jointing materials except mortar.

2.7.1. **Mortar**. Provide mortar for joints that meets the requirements of Section 464.3.3., "Jointing."

2.7.2. **Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Provide a material that consists of natural or processed asphalt base, suitable volatile solvents, and inert filler. Ensure the consistency is such that the ends of the pipe can be coated with a layer of the compound up to 1/2 in. thick by means of a trowel. Provide

a joint compound that cures to a firm, stiff plastic condition after application. Provide a material of a uniform mixture. Stir any small separation found in the container into a uniform mix before using.

Provide a material that meets the requirements of Table 4 when tested in accordance with Tex-526-C.

Table 4
Cold-Applied, Plastic Asphalt Sewer Joint Compound Material Requirements

Composition	Analysis
Asphalt base, 100%–% volatiles–% ash, % by weight	28–45
Volatiles, 212°F evaporation, 24 hr., % by weight	10–26
Mineral matter, determined as ash, % by weight	30–55
Consistency, cone penetration, 150 q, 5 sec., 77°F	150–275

2.7.3. **Rubber Gaskets**. Provide gaskets that conform to ASTM C1619 Class A or C. Meet the requirements of ASTM C443 for design of the pipe joints and permissible variations in dimensions.

2.7.4. **Pre-Formed Flexible Joint Sealants**. Pre-formed flexible joint sealants may be used for sealing joints of tongue-and-groove concrete pipe. Provide flexible joint sealants that meet the requirements of ASTM C990. Use flexible joint sealants that do not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. Supply in extruded rope form of suitable cross-section. Provide a size of the pre-formed flexible joint sealant in accordance with the manufacturer's recommendations and large enough to properly seal the joint. Protect flexible joint sealants with a suitable wrapper able to maintain the integrity of the jointing material when the wrapper is removed.

3. CONSTRUCTION

3.1. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," except where jacking, boring, or tunneling methods are permitted. Jack, bore, or tunnel the pipe in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Immediate backfilling is permitted if joints consist of materials other than mortar. Take special precautions in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. Do not use heavy earth-moving equipment to haul over the structure until a minimum of 4 ft. of permanent or temporary compacted fill has been placed over the structure unless otherwise shown on the plans or permitted in writing. Remove and replace pipe damaged by the Contractor at no expense to the Department.

3.2. **Laying Pipe**. Start the laying of pipe on the bedding at the outlet end with the spigot or tongue end pointing downstream, and proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grades unless otherwise authorized. Fit, match, and lay the pipe to form a smooth, uniform conduit. Cut cross trenches in the foundation to allow the barrel of the pipe to rest firmly upon the bedding where bell-and-spigot pipe is used. Cut cross trenches no more than 2 in. larger than the bell ends of the pipe. Lower sections of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Carefully clean the ends of the pipe before the pipe is placed. Prevent the earth or bedding material from entering the pipe as it is laid. Lay the pipe in the trench, when elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, so the markings for the top or bottom are not more than 5° from the vertical plane through the longitudinal axis of the pipe. Remove and re-lay, without extra compensation, pipe that is not in alignment or shows excessive settlement after laying.

Lay multiple lines of reinforced concrete pipe with the centerlines of the individual barrels parallel. Use the clear distances between outer surfaces of adjacent pipes shown in Table 5 unless otherwise shown on the plans. Use the equivalent diameter from Table 2 or Table 3 for arch pipe or horizontal elliptical pipe to determine the clear distance requirement in Table 5.

Table 5
Minimum Clear Distance between Pipes

Equivalent Diameter	Min Clear Distance
18 in.	9 in.
24 in.	11 in.
30 in.	1 ft. 1 in.
36 in.	1 ft. 3 in.
42 in.	1 ft. 5 in.
48 in.	1 ft. 7 in.
54 in.	1 ft. 11 in.
60 to 84 in.	2 ft.

3.3. **Jointing**. Make available an appropriate rolling device similar to an automobile mechanic's "creeper" for conveyance through small-size pipe structures.

3.3.1. **Joints Sealed with Hydraulic Cement Mortar**. Use Type S mortar meeting the requirements of ASTM C270. Clean and wet the pipe ends before making the joint. Plaster the lower half of the bell or groove and the upper half of the tongue or spigot with mortar. Pack mortar into the joint from both inside and outside the pipe after the pipes are tightly jointed. Finish the inside smooth and flush with adjacent joints of pipe. Form a bead of semicircular cross-section over tongue-and-groove joints outside the pipe, extending at least 1 in. on each side of the joint. Form the mortar for bell-and-spigot joints to a 45° fillet between the outer edge of the bell and the spigot. Cure mortar joints by keeping the joints wet for at least 48 hr. or until the backfill has been completed, whichever comes first. Place fill or backfill once the mortar jointing material has cured for at least 6 hr. Conduct jointing only when the atmospheric temperature is above 40°F. Protect mortared joints against freezing by backfilling or other approved methods for at least 24 hr.

Driveway culverts do not require mortar banding on the outside of the pipe.

Furnish pipes, with approval, that are large enough for a person to enter with the groove between 1/2 in. and 3/4 in. longer than the tongue. Such pipe may be laid and backfilled without mortar joints. Clean the space on the interior of the pipe between the end of the tongue and the groove of all foreign material, thoroughly wet and fill with mortar around the entire circumference of the pipe, and finish flush after the backfilling has been completed.

3.3.2. **Joints Using Cold-Applied, Plastic Asphalt Sewer Joint Compound**. Ensure both ends of the pipes are clean and dry. Trowel or otherwise place a 1/2–in. thick layer of the compound in the groove end of the pipe covering at least 2/3 of the joint face around the entire circumference. Shove home the tongue end of the next pipe with enough pressure to make a tight joint. Remove any excess mastic projecting into the pipe after the joint is made. Backfill after the joint has been inspected and approved.

3.3.3. **Joints Using Rubber Gaskets**. Make the joint assembly according to the recommendations of the gasket manufacturer. Make joints watertight when using rubber gaskets. Backfill after the joint has been inspected and approved.

3.3.4. **Joints Using Pre-Formed Flexible Joint Sealants**. Install pre-formed flexible joint sealants in accordance with the manufacturer's recommendations. Place the joint sealer so no dirt or other deleterious materials come in contact with the joint sealing material. Pull or push home the pipe with enough force to properly seal the joint. Remove any joint material pushed out into the interior of the pipe that would tend to obstruct the flow. Store pre-formed flexible joint sealants in an area warmed naturally or artificially to above 70°F in an approved manner when the atmospheric temperature is below 60°F. Apply flexible joint sealants to pipe joints immediately before placing pipe in trench, and connect pipe to previously laid pipe. Backfill after the joint has been inspected and approved.

3.4. **Connections and Stub Ends**. Make connections of concrete pipe to existing pipes, pipe storm drains, or storm drain appurtenances as shown on the plans.

Mortar or concrete the bottom of existing structures if necessary to eliminate any drainage pockets created by the connections. Repair any damage to the existing structure resulting from making the connections.

Make connections between concrete pipe and corrugated metal pipe with a suitable concrete collar and a minimum thickness of 4 in. unless otherwise shown on the plans.

Finish stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the pipe.

Fill lift holes with concrete, mortar, or precast concrete plugs after the pipe is in place.

4. MEASUREMENT

This Item will be measured by the foot. Measurement will be made between the ends of the pipe barrel along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, "Safety End Treatment." Pipe that will be jacked, bored, or tunneled will be measured in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Measurement of spurs, branches, or new connecting pipe will be made from the intersection of the flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, the length of pipe tying into the structure wall will be included for measurement, but no other portion of the structure length or width will be included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Reinforced Concrete Pipe," "Reinforced Concrete Pipe (Arch)," or "Reinforced Concrete Pipe (Elliptical)" of the size and D-load specified or of the size and class specified. This price is full compensation for constructing, furnishing, transporting, placing, and joining pipes; shaping the bed; cutting pipes on skew or slope; connecting to new or existing structures; breaking back, removing, and disposing of portions of the existing structure; replacing portions of the existing structure; cutting pipe ends on skew or slope; and equipment, labor, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring." Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400, "Excavation and Backfill for Structures." When jacking, boring, or tunneling is used at the Contractor's option, payment will be made under this Item. When jacking, boring or tunneling is required, payment will be made under Item 476, "Jacking, Boring or Tunneling Pipe or Box."

Item 465
Junction Boxes, Manholes, and Inlets

1. DESCRIPTION

Construct junction boxes, manholes, and inlets, complete in place or to the stage detailed, including furnishing and installing frames, grates, rings, and covers.

2. MATERIALS

Furnish materials in accordance with the following:

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 440, "Reinforcement for Concrete," and
- Item 471, "Frames, Grates, Rings, and Covers."

Cast-in-place junction boxes, manholes, inlets, risers, and appurtenances are acceptable unless otherwise shown. Alternate designs for cast-in-place items must be acceptable to the Engineer and must conform to functional dimensions and design loading. Alternate designs must be designed and sealed by a licensed professional engineer.

2.1. **Concrete**. Furnish Class H concrete as referenced in Item 421 "Hydraulic Cement Concrete," except that Mix Design Options 1–8 will be allowed for formed precast junction boxes, manholes, and inlets. Furnish concrete per DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification," for machine-made precast junctions boxes, manholes, and inlets. Furnish Class C concrete for cast-in-place manholes and inlets unless otherwise shown on the plans.

2.2. **Mortar**. Furnish mortar conforming to DMS-4675, "Cementitious Grouts and Mortars for Miscellaneous Applications."

2.3. **Timber**. Provide sound timber that is a minimum of 3 in. nominal thickness and reasonably free of knots and warps for temporary covers when used with Stage I construction (see Article 465.3., "Construction").

2.4. **Other Materials**. Use commercial-type hardware as approved.

3. CONSTRUCTION

Construct all types of junction boxes, manholes, and inlets either complete or in 2 stages, described as Stage I and Stage II.

Construct the Stage I portion of junction boxes, manholes, and inlets as shown on the plans or as specified in this Item. Furnish and install a temporary cover as approved.

Furnish and install the storm drain pipe and a temporary plug for the exposed end of the storm drain pipe from the storm drain to a point below the top of curb indicated on the plans for Stage I construction of cast iron or steel inlet units.

Construct Stage II after the pavement structure is substantially complete unless otherwise approved.

Construct the remaining wall height and top of junction box, manhole, or inlet for Stage II, and furnish and install any frames, grates, rings and covers, curb beams, or collecting basins required.

Construct cast-in-place junction boxes, manholes, and inlets in accordance with Item 420, "Concrete Substructures." Forms will be required for all concrete walls. Outside wall forms for cast-in-place concrete may be omitted with approval if the surrounding material can be trimmed to a smooth vertical face.

3.1. **Precast Junction Boxes, Manholes, and Inlets**. Construct formed precast junction boxes, manholes, and inlets in accordance with Item 420, "Concrete Substructures," except as otherwise noted in this Item. Construct machine-made precast junction boxes, manholes, and inlets in accordance with ASTM C478 except as otherwise noted in this Item. Mix and place concrete for machine-made junction boxes, manholes, and inlets per the requirements of DMS-7310, "Reinforced Concrete Pipe and Machine-Made Precast Concrete Box Culvert Fabrication and Plant Qualification." Conform to the product permissible variations and rejection criteria stated in ASTM C478 for machine-made precast junction boxes, manholes, and inlets. Cure all precast units in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)."

Multi-project fabrication plants as defined in Item 424 "Precast Concrete Structural Members (Fabrication)," that produce manholes and inlets will be approved by the Construction Division in accordance with DMS-7340, "Qualification Procedure for Multi-Project Fabrication Plants of Precast Concrete Junction Boxes, Manholes and Inlets." The Department's MPL has a list of approved multi-project plants.

3.1.1. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 5 in. in any direction of reinforcement per layer for lifting holes. Repair spalled areas around lifting holes.

3.1.2. **Marking**. Clearly mark each precast junction box, manhole, and inlet unit with the following information:

- name or trademark of fabricator and plant location;
- product designation;
- ASTM designation (if applicable);
- date of manufacture;
- designated fabricator's approval stamp; and
- designation "SR" for product meeting sulfate-resistant concrete plan requirements (when applicable).

3.1.3. **Storage and Shipment**. Store precast units on a level surface. Do not ship units until design strength requirements have been met.

3.2. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Immediate backfilling is permitted for all junction box, manhole, and inlet structures where joints consist of rubber boots, rubber gaskets, or bulk or preformed joint sealant. Take precautions in placing and compacting the backfill to avoid any movement of junction boxes, manholes, and inlets. Remove and replace junction boxes, manholes, and inlets damaged by the Contractor at no expense to the Department.

3.3. **Junction Boxes, Manholes, and Inlets for Precast Concrete Pipe Storm Drains**. Construct junction boxes, manholes, and inlets for precast concrete pipe storm drains before completion of storm drain lines into or through the junction box, manhole, or inlet. Neatly cut all storm drains at the inside face of the walls of the junction box, manhole, or inlet.

3.4. **Junction Boxes, Manholes, and Inlets for Box Storm Drains**. Place bases or risers of junction boxes, manholes, and inlets for box storm drains before or in conjunction with placement of the storm drain. Backfill the junction box, manhole, or inlet and storm drain as a whole.

3.5. **Inverts**. Shape and route floor inverts passing out or through the junction box, manhole, or inlet as shown on the plans. Shape by adding and shaping mortar or concrete after the base is placed or by placing the required additional material with the base.

3.6. **Finishing Complete Junction Boxes, Manholes, and Inlets**. Complete junction boxes, manholes, and inlets in accordance with the plans. Backfill to original ground elevation in accordance with Item 400, "Excavation and Backfill for Structures."

3.7. **Finishing Stage I Construction**. Complete Stage I construction by constructing the walls to the elevations shown on the plans and backfilling to required elevations in accordance with Item 400, "Excavation and Backfill for Structures."

3.8. **Stage II Construction**. Construct subgrade and base course or concrete pavement construction over Stage I junction box, manhole, or inlet construction unless otherwise approved. Excavate to expose the top of Stage I construction and complete the junction box, manhole or inlet in accordance with the plans and these Specifications, including backfill and cleaning of all debris from the bottom of the junction box, manhole, or inlet.

3.9. **Inlet Units**. Install cast iron or steel inlet units in conjunction with the construction of concrete curb and gutter. Set the inlet units securely in position before placing concrete for curb and gutter. Form openings for the inlets and recesses in curb and gutter as shown on the plans. Place and thoroughly consolidate concrete for curb and gutter adjacent to inlets and around the inlet castings and formed openings and recesses without displacing the inlet units.

4. MEASUREMENT

All junction boxes, manholes, and inlets satisfactorily completed in accordance with the plans and specifications will be measured by each junction box, manhole, or inlet, complete, or by each junction box, manhole, or inlet completed to the stage of construction required by the plans.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for as follows:

5.1. **Complete Manholes**. Payment for complete manholes will be made at the unit price bid for "Manhole (Complete)" of the type specified.

5.2. **Complete Inlets**. Payment for inlets will be made at the unit price bid for "Inlet (Complete)," of the type specified.

5.3. **Complete Junction Boxes**. Payment for junction boxes will be made at the unit price bid for "Junction Box (Complete)" of the type specified.

5.4. **Manholes Stage I**. Payment for Manholes, Stage I, will be made at the unit price bid for each "Manhole (Stage I)" of the type specified.

5.5. **Manholes Stage II**. Payment for Manholes, Stage II, will be made at the unit price bid for each "Manhole (Stage II)" of the type specified.

5.6. **Inlets Stage I**. Payment for Inlets, Stage I, will be made at the unit price bid for each "Inlet (Stage I)" of the type specified.

5.7. **Inlets Stage II**. Payment for Inlets, Stage II, will be made at the unit price bid for each "Inlet (Stage II)" of the type specified.

5.8. **Junction Boxes Stage I**. Payment for Junction Boxes, Stage I, will be made at the unit price bid for each "Junction Box (Stage I)" of the type specified.

5.9. **Junction Boxes Stage II**. Payment for Junction Boxes, Stage II, will be made at the unit price bid for each "Junction Box (Stage II)" of the type specified.

This price is full compensation for concrete, reinforcing steel, mortar, frames, grates, rings and covers, excavation, and backfill and for all other materials, tools, equipment, labor, and incidentals.

Item 466
Headwalls and Wingwalls

1. DESCRIPTION

Furnish, construct, and install concrete headwalls and wingwalls for drainage structures and underpasses.

2. MATERIALS

2.1. **General**. Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete," and
- Item 440, "Reinforcement for Concrete."

Use Class C concrete for cast-in-place and precast concrete units unless otherwise shown on the plans. Furnish cast-in-place or precast headwalls and wingwalls unless otherwise shown on the plans.

2.2. **Fabrication**.

2.2.1. **General**. Fabricate cast-in-place concrete units and precast units in accordance with Item 420 "Concrete Substructures." Use the following definitions for headwalls and wingwalls:

- "Headwalls" refers to all walls, including wings, at the ends of single-barrel and multiple-barrel pipe culvert structures.
- "Wingwalls" refers to all walls at the ends of single-barrel or multiple-barrel box culvert structures.

2.2.2. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel when locating lift holes. Repair spalled areas around lifting holes.

2.2.3. **Marking**. Clearly mark each precast unit before shipment from the casting or fabrication yard with the following:

- the date of manufacture,
- the name or trademark of the manufacturer, and
- the type and size designation.

2.2.4. **Storage and Shipment**. Store precast units on a level surface. Do not place any loads on precast concrete units until design strength is reached. Do not ship units until design strength requirements have been met.

2.2.5. **Causes for Rejection**. Precast units may be rejected for not meeting any one of the specification requirements. Individual units may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces. Remove rejected units from the project, and replace them with acceptable units meeting the requirements of this Item.

2.2.6. **Defects and Repairs**. Occasional imperfections in manufacture or accidental damage sustained during handling may be repaired. The repaired units will be acceptable if they conform to the requirements of this Item and the repairs are sound, properly finished, and cured in conformance with pertinent specifications.

3. CONSTRUCTION

3.1. **General**. Remove portions of existing structures and drill, dowel, and grout in accordance with Item 420, "Concrete Substructures."

3.2. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.

3.3. **Placement of Precast Units**. Provide adequate means to lift and place the precast units. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.

3.4. **Connections**. Make connections to new or existing structures in accordance with the details shown on the plans. Furnish jointing material in accordance with Item 464, "Reinforced Concrete Pipe," or as shown on the plans.

Remove a length of the existing pipe from the headwall to the joint when removing existing headwalls as shown on the plans or as approved. Re-lay the removed pipe if approved, or furnish and lay a length of new pipe.

4. MEASUREMENT

This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

4.1. **Headwalls**. Headwalls will be measured by each end of a structure.

4.2. **Wingwalls**. Wingwalls will be measured by one of the following methods:

4.2.1. **Square Foot**. Wingwalls will be measured by the square foot of the front surface area of the wall of each type. The area will be measured from the top of the footing or apron to the top of the wall unless otherwise shown on the plans. If there is no footing or apron, then measurement is from the bottom of the wall.

4.2.2. **Each**. Wingwalls will be measured by each end of a structure.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the price bid for "Headwalls" of the type and pipe size (diameter or design) specified, "Wingwalls" of the type specified when measurement is by the square foot, or "Wingwalls" of the type and wall height specified when measurement is by each. For payment purposes, the wingwall height will be rounded to the nearest foot. All wingwalls and headwalls of the same type will be paid for equally when skew does not affect the type. This price is full compensation for constructing, furnishing, transporting, and installing the headwalls or wingwalls; connecting to existing structure; breaking back, removing and disposing of portions of the existing structure, and replacing portions of the existing structure as required to make connections; excavation and backfill; and concrete, reinforcing steel, corrugated metal pipe or reinforced concrete pipe, equipment, labor, tools, and incidentals.

Apron concrete or riprap between or around the wingwalls of single- or multiple-barrel box culvert structures will be measured and paid for in accordance with Item 432, "Riprap."

The removal and re-laying of existing pipe or the furnishing of new pipe to replace existing pipe will not be paid for directly but will be considered subsidiary to this Item.

Item 467
Safety End Treatment

1. DESCRIPTION

Furnish, construct, and install safety end treatments for drainage structures, or install or replace pipe runners or pipe runner assemblies on existing drainage structures.

2. MATERIALS

2.1. **General**. Furnish materials in accordance with the following.

- Item 420, “Concrete Substructures,”
- Item 421, “Hydraulic Cement Concrete,”
- Item 432, “Riprap,”
- Item 440, “Reinforcement for Concrete,”
- Item 442, “Metal for Structures,”
- Item 445, “Galvanizing,”
- Item 460, “Corrugated Metal Pipe,” and
- Item 464, “Reinforced Concrete Pipe.”

Use Class C concrete for cast-in-place and precast concrete units unless otherwise shown on the plans. Furnish cast-in-place or precast safety end treatments unless otherwise shown on the plans. Furnish Class B concrete for concrete riprap unless otherwise shown on the plans. Provide galvanized steel for prefabricated metal end sections in accordance with Item 460, “Corrugated Metal Pipe.”

Furnish pipe runners in accordance with the following:

- ASTM A1085;
- ASTM A53, Type E or S, Grade B;
- ASTM A500, Grade B; or
- API 5L, Grade X42.

Furnish plates and angles in accordance with ASTM A36. Furnish nuts and bolts in accordance with ASTM A307. Galvanize pipes, plates, angles, nuts, and bolts in accordance with Item 445, “Galvanizing.”

2.2. **Fabrication**. Fabricate cast-in-place concrete units and precast units in accordance with Item 420, “Concrete Substructures.” Provide either prefabricated metal end sections or mitered CMP when specified for the pipe structure unless otherwise shown on the plans.

Provide one of the following when reinforced concrete pipe (RCP) is specified for the pipe structure, unless otherwise shown on the plans:

- mitered RCP or
- precast safety end treatment (SET) units. Provide riprap only if the plans specifically require it for this alternative.

2.2.1. **SET Types**.

2.2.1.1. **Type I**. Provide Type I SET consisting of reinforced concrete headwalls or wingwalls and pipe runners in accordance with the details shown on the plans when required.

2.2.1.2. **Type II**. Provide Type II SET in accordance with the details shown on the plans consisting of the following:

- CMP or RCP mitered to the proper slope, concrete riprap and pipe runners, when required;
- prefabricated metal end sections, concrete riprap and pipe runners, when required; or
- precast SET units, concrete riprap, when required, and pipe runners, when required.

2.2.2. **Lifting Holes**. Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel when locating lift holes. Repair spalled areas around lifting holes.

2.2.3. **Marking**. Clearly mark the following on each precast unit, mitered CMP, mitered RCP, or metal end section before shipment from the casting or fabrication yard:

- the date of manufacture,
- the name or trademark of the manufacturer, and
- the type and size designation.

2.2.4. **Storage and Shipment**. Store precast units on a level surface. Do not place any loads on precast units until the design strength is reached. Do not ship units until design strength requirements have been met.

2.2.5. **Causes for Rejection**. Precast units may be rejected for not meeting any one of the specification requirements. Individual units may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces. Remove rejected units from the project and replace with acceptable units meeting the requirements of this Item.

2.2.6. **Defects and Repairs**. Occasional imperfections in manufacture or accidental damage sustained during handling may be repaired. The repaired units will be acceptable if they conform to the requirements of this Item and the repairs are sound and properly finished and cured in conformance with pertinent specifications. Repair damaged galvanizing in accordance with Section 445.3.5., “Repairs.”

3. CONSTRUCTION

3.1. **General**. Remove portions of existing structures in accordance with Section 420.4.8., “Extending Existing Substructures.” Drill, dowel, and grout in accordance with Item 420, “Concrete Substructures.” Furnish concrete riprap in accordance with Item 432, “Riprap.”

Provide riprap on all prefabricated metal end sections.

3.2. **Excavation, Shaping, Bedding, and Backfill**. Excavate, shape, bed, and backfill in accordance with Item 400, “Excavation and Backfill for Structures.” Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.

3.3. **Placement of Precast Units**. Provide adequate means to lift and place the precast units. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.

3.4. **Connections**. Make connections to new or existing structures in accordance with the details shown on the plans. Furnish jointing material in accordance with Item 464, “Reinforced Concrete Pipe.”

Also remove a length of the existing pipe from the headwall to the joint when removing existing headwalls as shown on the plans or as approved. Re-lay the removed pipe if approved, or furnish and lay a length of new pipe.

3.5. **Install or Replace Pipe Runners or Assemblies**. Install or replace individual pipe runners or pipe runner assemblies on existing drainage structures as indicated on the plans.

4. MEASUREMENT

SETs of all types will be measured by each barrel of each structure end.

Pipe runners or pipe runner assemblies installed or replaced on existing structure will be measured by each installed or replaced on each structure end.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the various designations of "Safety End Treatment" specified as follows:

- SET (Type I) (Barrel Span) (Wall Height) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Type I) (Pipe Diameter or Design) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Type II) (Pipe Diameter or Design) (Pipe Material) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Pipe Runner)
- SET (Pipe Runner Assembly)

For payment purposes, the wingwall heights of Type I SETs for box culverts will be rounded to the nearest foot.

This price is full compensation for constructing, furnishing, transporting, and installing the end treatments; pipe runners, or pipe runner assemblies, connecting to existing structure; breaking back, removing and disposing of portions of the existing structure, removing and disposing of existng pipe runner or pipe runner assemblies, and replacing portions of the existing structure as required to make connections; excavation and backfill; furnishing concrete, reinforcing steel, corrugated metal pipe or reinforced concrete pipe, and pipe runners; and concrete riprap, nuts, bolts, plates, angles, equipment, labor, tools, and incidentals.

The removal and re-laying of existing pipe or the furnishing of new pipe to replace existing pipe will not be paid for directly but will be considered subsidiary to this Item.

The mitered length of CMP or RCP that is a part of the SET (Type II) will not be paid for directly but will be considered subsidiary to this Item. The limits for payment for pipe will be as shown on the plans and paid for in accordance with the pertinent bid item.

The limits of riprap to be included in the price bid for each SET will be shown on the plans. Any riprap placed beyond the limits shown will be paid in accordance with Item 432, "Riprap." Riprap between multiple precast SET units will be required as shown on the plans and is included in the price bid for SET.

When precast SETs are provided as an option to mitered RCP, riprap aprons will not be required unless the plans specifically require riprap aprons for precast SET units. The plans will show the limits of the riprap to be included with the precast SET for payment.

Item 506

Temporary Erosion, Sedimentation, and Environmental Controls

1. DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SWP3) on the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000. Control measures are defined as Best Management Practices used to prevent or reduce the discharge of pollutants. Control measures include, but are not limited to, rock filter dams, temporary pipe slope drains, temporary paved flumes, construction exits, earthwork for erosion control, pipe, construction perimeter fence, sandbags, temporary sediment control fence, biodegradable erosion control logs, vertical tracking, temporary or permanent seeding, and other measures. Erosion and sediment control devices must be selected from the *Erosion Control Approved Products* or *Sediment Control Approved Products* lists. Perform work in a manner to prevent degradation of receiving waters, facilitate project construction, and comply with applicable federal, state, and local regulations. Ensure the installation and maintenance of control measures is performed in accordance with the manufacturer's or designer's specifications.

Provide the Contractor Certification of Compliance before performing SWP3 or soil disturbing activities. By signing the Contractor Certification of Compliance, the Contractor certifies they have read and understand the requirements applicable to this project pertaining to the SWP3, the plans, and the TPDES General Permit TXR150000. The Contractor is responsible for any penalties associated with non-performance of installation or maintenance activities required for compliance. Ensure the most current version of the certificate is executed for this project.

2. MATERIALS

Furnish materials in accordance with the following:

- Item 161, "Compost,"
- Item 432, "Riprap," and
- Item 556, "Pipe Underdrains."

2.1. **Rock Filter Dams**.

2.1.1. **Aggregate**. Furnish aggregate with approved hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding. Provide the following:

- Types 1, 2, and 4 Rock Filter Dams. Use 3 to 6 in. aggregate.
- Type 3 Rock Filter Dams. Use 4 to 8 in. aggregate.

2.1.2. **Wire**. Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

- a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 × 3-1/4 in.;
- minimum 0.0866 in. steel wire for netting;
- minimum 0.1063 in. steel wire for selvages and corners; and
- minimum 0.0866 in. for binding or tie wire.

2.1.3. **Sandbag Material**. Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

2.2. **Temporary Pipe Slope Drains**. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432, "Riprap."

2.3. **Temporary Paved Flumes**. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.

2.4. **Construction Exits**. Provide materials that meet the details shown on the plans and this Section.

2.4.1. **Rock Construction Exit**. Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1. Use 2- to 4-in. aggregate for Type 3.

2.4.2. **Timber Construction Exit**. Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least 1/2 in. thick for short-term exits.

2.4.3. **Foundation Course**. Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.

2.5. **Embankment for Erosion Control**. Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.

2.6. **Pipe**. Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.

2.7. **Construction Perimeter Fence**.

2.7.1. **Posts**. Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in., or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.

2.7.2. **Fence**. Provide orange construction fencing as approved.

2.7.3. **Fence Wire**. Provide 14 gauge or larger galvanized smooth or twisted wire. Provide 16 gauge or larger tie wire.

2.7.4. **Flagging**. Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.

2.7.5. **Staples**. Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.

2.7.6. **Used Materials**. Previously used materials meeting the applicable requirements may be used if approved.

2.8. **Sandbags**. Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 psi, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1
Sand Gradation

Sieve Size	Retained (% by Weight)
#4	Maximum 3%
#100	Minimum 80%
#200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size must not exceed 3/8 in.

2.9. **Temporary Sediment Control Fence**. Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.

2.9.1. **Fabric**. Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."

2.9.2. **Posts**. Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans. Furnish soft wood posts at least 3 in. in diameter, or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.25 lb. per foot.

2.9.3. **Net Reinforcement**. Provide net reinforcement of at least 12.5 gauge (SWG) galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.

2.9.4. **Staples**. Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.

2.9.5. **Used Materials**. Use recycled material meeting the applicable requirements if approved.

2.10. **Biodegradable Erosion Control Logs**.

2.10.1. **Core Material**. Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161, "Compost."

2.10.2. **Containment Mesh**. Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.

Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.

Furnish recyclable containment mesh for temporary installations.

2.10.3. **Size**. Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

3. QUALIFICATIONS, TRAINING, AND EMPLOYEE REQUIREMENTS

3.1. **Contractor Responsible Person Environmental (CRPE) Qualifications and Responsibilities**. Provide and designate in writing at the preconstruction conference a CRPE and alternate CRPE who have overall responsibility for the storm water management program. The CRPE will implement storm water and erosion control practices; will oversee and observe storm water control measure monitoring and management; will monitor the project site daily and produce daily monitoring reports as long as there are BMPs in place or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or on contract non-work days, daily inspections are not required unless a rain event has occurred. The CRPE will provide recommendations on

how to improve the effectiveness of control measures. Attend the Department's preconstruction conference for the project. Ensure training is completed as identified in Section 506.3.3., "Training," by all applicable personnel before employees work on the project. Document and submit a list, signed by the CRPE, of all applicable Contractor and subcontractor employees who have completed the training. Include the employee's name, the training course name, and date the employee completed the training. Provide the most current list at the preconstruction conference or before SWP3 or soil disturbing activities. Update the list as needed and provide the updated list when updated.

3.2. **Contractor Superintendent Qualifications and Responsibilities**. Provide a superintendent that is competent, has experience with and knowledge of storm water management, and is knowledgeable of the requirements and the conditions of the TPDES General Permit TXR150000. The superintendent will manage and oversee the day to day operations and activities at the project site; work with the CRPE to provide effective storm water management at the project site; represent and act on behalf of the Contractor; and attend the Department's preconstruction conference for the project.

3.3. **Training**. All Contractor and subcontractor employees involved in soil disturbing activities, small or large structures, storm water control measures, and seeding activities must complete training as prescribed by the Department.

4. CONSTRUCTION

4.1. **Contractor Responsibilities**. Implement the SWP3 for the project site in accordance with the plans and specifications, TPDES General Permit TXR150000, and as directed. Coordinate storm water management with all other work on the project. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Department's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.

4.2. **Implementation**. The CRPE, or alternate CRPE, must be accessible by phone and able to respond to project-related storm water management or other environmental emergencies 24 hr. per day.

4.2.1. **Commencement**. Implement the SWP3 as shown and as directed. Contractor-proposed recommendations for changes will be allowed as approved. Conform to the established guidelines in the TPDES General Permit TXR150000 to make changes. Do not implement changes until approval has been received and changes have been incorporated into the plans. Minor adjustments to meet field conditions are allowed and will be recorded in the SWP3.

4.2.2. **Phasing**. Implement control measures before the commencement of activities that result in soil disturbance. Phase and minimize the soil disturbance to the areas shown on the plans. Coordinate temporary control measures with permanent control measures and all other work activities on the project to assure economical, effective, safe, and continuous water pollution prevention. Provide control measures that are appropriate to the construction means, methods, and sequencing allowed by the Contract. Exercise precaution throughout the life of the project to prevent pollution of ground waters and surface waters. Schedule and perform clearing and grubbing operations so that stabilization measures will follow immediately thereafter if project conditions permit. Bring all grading sections to final grade as soon as possible and implement temporary and permanent control measures at the earliest time possible. Implement temporary control measures when required by the TPDES General Permit TXR150000 or otherwise necessitated by project conditions.

Do not prolong final grading and shaping. Preserve vegetation where possible throughout the project, and minimize clearing, grubbing, and excavation within stream banks, bed, and approach sections.

4.3. **General**.

4.3.1. **Temporary Alterations or Control Measure Removal**. Altering or removal of control measures is allowed when control measures are restored within the same working day.

4.3.2. **Stabilization**. Initiate stabilization for disturbed areas no more than 14 days after the construction activities in that portion of the site have temporarily or permanently ceased. Establish a uniform vegetative cover or use another stabilization practice in accordance with the TPDES General Permit TXR150000.

4.3.3. **Finished Work**. Remove and dispose of all temporary control measures upon acceptance of vegetative cover or other stabilization practice unless otherwise directed. Complete soil disturbing activities and establish a uniform perennial vegetative cover. A project will not be considered for acceptance until a vegetative cover of 70% density of existing adjacent undisturbed areas is obtained or equivalent permanent stabilization is obtained in accordance with the TPDES General Permit TXR150000. An exception will be allowed in arid areas as defined in the TPDES General Permit TXR150000.

4.3.4. **Restricted Activities and Required Precautions**. Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in the TPDES General Permit TXR150000. Use appropriate controls to minimize the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e., dewatering). Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.

4.4. **Installation, Maintenance, and Removal Work**. Perform work in accordance with the SWP3, according to manufacturers' guidelines, and in accordance with the TPDES General Permit TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as approved.

The Department will inspect and document the condition of the control measures at the frequency shown on the plans and will provide the Construction SWP3 Field Inspection and Maintenance Reports to the Contractor. Make corrections as soon as possible before the next anticipated rain event or within 7 calendar days after being able to enter the worksite for each control measure. The only acceptable reason for not accomplishing the corrections with the time frame specified is when site conditions are "Too Wet to Work." Take immediate action if a correction is deemed critical as directed. When corrections are not made within the established time frame, all work will cease on the project and time charges will continue while the control measures are brought into compliance. Commence work once the Engineer reviews and documents the project is in compliance. Commencing work does not release the Contractor of the liability for noncompliance of the SWP3, plans, or TPDES General Permit TXR150000.

The Engineer may limit the disturbed area if the Contractor cannot control soil erosion and sedimentation resulting from the Contractor's operations. Implement additional controls as directed.

Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.

4.4.1. **Rock Filter Dams for Erosion Control**. Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.

Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings for Types 2 and 3, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria unless otherwise shown on the plans:

4.4.1.1. **Type 1 (Non-Reinforced)**.

- **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.2. **Type 2 (Reinforced)**.

- **Height**. At least 18 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.3. **Type 3 (Reinforced)**.

- **Height**. At least 36 in. measured vertically from existing ground to top of filter dam.
- **Top Width**. At least 2 ft.
- **Slopes**. No steeper than 2:1.

4.4.1.4. **Type 4 (Sack Gabions)**. Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single loop–double loop pattern on 4- to 5-in. spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist 4 times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times.

Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.

Lift and place without damaging the gabion. Shape sack gabions to existing contours.

4.4.1.5. **Type 5**. Provide rock filter dams as shown on the plans.

4.4.2. **Temporary Pipe Slope Drains**. Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, “Riprap,” when designated on the plans.

4.4.3. **Temporary Paved Flumes**. Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.

4.4.4. **Construction Exits**. Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long- or short-term use.

4.4.4.1. **Long-Term**. Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.

4.4.4.1.1. **Type 1**. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.

4.4.4.1.2. **Type 2**. Construct using railroad ties and timbers as shown on the plans or as directed.

4.4.4.2. **Short-Term**.

4.4.4.2.1. **Type 3**. Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

4.4.4.2.2. **Type 4**. Construct as shown on the plans or as directed.

4.4.5. **Earthwork for Erosion Control**. Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.

4.4.5.1. **Excavation and Embankment for Erosion Control Features**. Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.

Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.

4.4.5.2. **Excavation of Sediment and Debris**. Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.

4.4.6. **Construction Perimeter Fence**. Construct, align, and locate fencing as shown on the plans or as directed.

4.4.6.1. **Installation of Posts**. Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.

4.4.6.2. **Wire Attachment**. Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.

4.4.6.3. **Flag Attachment**. Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.

4.4.7. **Sandbags for Erosion Control**. Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.

4.4.8. **Temporary Sediment-Control Fence**. Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.

4.4.8.1. **Installation of Posts**. Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the runoff source.

4.4.8.2. **Fabric Anchoring**. Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 × 6 in. Place the fabric against the side of the trench and align approximately 2 in. of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.

4.4.8.3. **Fabric and Net Reinforcement Attachment**. Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced unless otherwise shown on the plans. Sewn

vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

4.4.8.4. **Fabric and Net Splices**. Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment-control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.

4.4.9. **Biodegradable Erosion Control Logs**. Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown on the plans, or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and as approved, such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

4.4.10. **Vertical Tracking**. Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring a minimum of 12 in. long × 2 to 4 in. wide × 1/2 to 2 in. deep. Do not exceed 12 in. between track impressions. Install continuous linear track impressions where the 12 in. length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred unless otherwise approved.

4.5. **Monitoring and Documentation**. Monitor the control measures on a daily basis as long as there are BMPs in place and/or soil disturbing activities are evident to ensure compliance with the SWP3 and TPDES General Permit TXR150000. During time suspensions when work is not occurring or contract non-work days, daily inspections are not required unless a rain event has occurred. Monitoring will consist of, but is not limited to, observing, inspecting, and documenting site locations with control measures and discharge points to provide maintenance and inspection of controls as described in the SWP3. Keep written records of daily monitoring. Document in the daily monitoring report the control measure condition, the date of inspection, required corrective actions, responsible person for making the corrections, and the date corrective actions were completed. Maintain records of all monitoring reports at the project site or at an approved place. Provide copies within 7 days. Together, the CRPE and an Engineer's representative will complete the Construction Stage Gate Checklist on a periodic basis as directed.

5. MEASUREMENT

5.1. **Rock Filter Dams**. Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.

5.1.1. **Linear Measurement**. When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.

5.1.2. **Volume Measurement**. When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.

5.1.2.1. **Installation**. Measurement will be made in final position.

5.1.2.2. **Removal**. Measurement will be made at the point of removal.

5.2. **Temporary Pipe Slope Drains**. Temporary pipe slope drains will be measured by the foot.

5.3. **Temporary Paved Flumes**. Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.

5.4. **Construction Exits**. Construction exits will be measured by the square yard of surface area.

5.5. **Earthwork for Erosion and Sediment Control**.

5.5.1. **Equipment and Labor Measurement**. Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.

5.5.2. **Volume Measurement**.

5.5.2.1. **In Place**.

5.5.2.1.1. **Excavation**. Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.

5.5.2.1.2. **Embankment**. Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:

- the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
- the lines, grades and slopes of the accepted embankment for the feature.

5.5.2.2. **In Vehicles**. Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.

5.6. **Construction Perimeter Fence**. Construction perimeter fence will be measured by the foot.

5.7. **Sandbags for Erosion Control**. Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.

5.8. **Temporary Sediment-Control Fence**. Installation or removal of temporary sediment-control fence will be measured by the foot.

5.9. **Biodegradable Erosion Control Logs**. Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.

5.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

6. PAYMENT

The following will not be paid for directly but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter, unless a separate pay item is shown on the plans;
- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;

- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items except vertical tacking which is subsidiary.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

6.1. **Rock Filter Dams**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

6.1.1. **Installation**. Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.1.2. **Removal**. Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Engineer directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.2. **Temporary Pipe Slope Drains**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

6.3. **Temporary Paved Flumes**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Engineer directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

6.4. **Construction Exits**. Contractor-required construction exits from off right of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Department will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Engineer directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

6.5. **Earthwork for Erosion and Sediment Control**.

6.5.1. **Initial Earthwork for Erosion and Sediment Control**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Excavation (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, (In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment including hauling, disposal of material not used elsewhere on the project; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

6.5.2. **Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control Measures**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to the Engineer.

This price is full compensation for excavation, embankment, and re-grading including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly but will be subsidiary to this Item.

6.6. **Construction Perimeter Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will be not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

6.7. **Sandbags for Erosion Control**. Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Engineer directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

6.8. **Temporary Sediment-Control Fence**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

6.8.1. **Installation**. Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

6.8.2. **Removal**. Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

6.9. **Biodegradable Erosion Control Logs**. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

6.9.1. **Installation**. Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.

6.9.2. **Removal**. Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

6.10. **Vertical Tracking**. Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

Notice of Award

2023 OSTOS ROAD PAVEMENT REHABILITATION

TO:

PROJECT DESCRIPTION:
2023 OSTOS ROAD PAVEMENT REHABILITATION

Dear Sir:

The Brownsville Navigation District ("Owner") has considered the bid submitted by your company for the above referenced project in response to its Invitation for Bids dated **10/31/2022** and **11/7/2022**, and the Instructions to Bidders.

You are hereby notified that your bid has been accepted by the Brownsville Navigation District in the amount of **-**.

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

If you fail to execute this Agreement and furnish the bonds and insurance certificates within ten (10) days from the date of this Notice, Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your bid as abandoned and as a forfeiture of your BID BOND.

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

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

Dated this _____ day of _____, 20 _____.

OWNER: BROWNSVILLE NAVIGATION DISTRICT, TEXAS.

By: _____
ARIEL CHAVEZ II, P.E./R.P.L.S.
Director of Engineering Services

Acceptance of Notice

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

By: _____
OFFICER'S NAME
Officer's Title

Notice to Proceed

2023 OSTOS ROAD PAVEMENT REHABILITATION

Dated: _____

TO:

PROJECT DESCRIPTION:
2023 OSTOS ROAD PAVEMENT REHABILITATION

OWNER's Contract No.: _____-_____

CONTRACT FOR: [Description of Work]

Dear Sir:

You are hereby notified that the Contract Time under the above contract will commence to run on _____-_____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement the dates of Substantial Completion and completion and readiness for final payment are _____-_____ and _____-_____.

Before you may start any Work at the site, paragraph 2.7 of the Standard General Conditions provides that you and Owner must each deliver to the other (with copies to ENGINEER and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also before you may start any Work at the site, you must coordinate the BND Engineering Department for any possible modifications to the contract documents.

OWNER: BROWNSVILLE NAVIGATION DISTRICT, TEXAS.

By: _____
ARIEL CHAVEZ II, P.E./R.P.L.S.
Director of Engineering Services

Acceptance of Notice

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

By: _____
OFFICER'S NAME
Officer's Title

Affidavit of All Bills Paid

2023 OSTOS ROAD PAVEMENT REHABILITATION

STATE OF TEXAS §
COUNTY OF CAMERON §

BEFORE ME, the undersigned authority, on this day personally appeared **[Name & Title of Company Officer]** of **[Name of Company]**, and upon oath, after first being duly sworn, deposed and stated:

"My name is **[Name & Title of Company Officer]** of **[Name of Company]**, hereinafter referred to in this affidavit as "Contractor". Contractor's business address is [Contractor's Business Address]. The facts set forth herein are within my personal knowledge and are true and correct, and I am competent and authorized to make this affidavit on behalf of Contractor.

Pursuant to and in accordance with a written construction contract between Contractor and Brownsville Navigation District of Cameron County, Texas, hereinafter referred to in this affidavit as "Owner", Contractor furnished materials and labor for the construction, renovation, or repair of improvements located on or relating to the project known as the **2023 OSTOS ROAD PAVEMENT REHABILITATION**, hereinafter referred to as the "Project", located at the Port of Brownsville, Cameron County, Texas. All work provided for under said written construction contract, together with all changes and supplements thereto, has been fully completed in a good and workmanlike manner, free of defects, and in accordance with the terms and provisions thereof.

Contractor has paid each of its subcontractors, laborers, vendors, lessors of equipment, suppliers, and materialmen in full for all labor and materials provided to Contractor for or in connection with the construction, renovation, or repair of improvements on or relating to the Project. Contractor is not aware of any unpaid bills, payrolls, material bills, claims, demands, or causes of action by any of its subcontractors, laborers, suppliers, or materialmen for or in connection with the furnishing of labor or materials, or both, for construction, renovation, or repair of improvements in connection with the Project.

In consideration of the funds paid to Contractor by Owner in reliance on this affidavit, Contractor waives and releases all of Contractor's contractual, statutory, and constitutional mechanic's lien rights connected with the Project, conditioned on the actual payment or collection if payment is made by check or draft. There are no outstanding claims or liens against the Project or any bonds issued in connection therewith.

Contractor further understands that this affidavit is being given pursuant to and in accordance with Section 53.085 of the Texas Property Code and that the intentional, knowing, or

reckless making of a false or misleading statement in this Affidavit constitutes an offense under said Section and is a misdemeanor. A person adjudged guilty of an offense under said Section shall be punished by a fine not to exceed $4,000 or confinement in jail for a term not to exceed one year or both a fine or confinement. A person may not receive community supervision for the offense. The undersigned further understands that a person signing an affidavit under Section 53.085 of the Texas Property Code may be personally liable for any loss or damage resulting from any false or incorrect information in the affidavit.

Contractor hereby indemnifies and holds harmless Owner from any and all claims, demands or causes of action, and any costs, expenses, and attorney's fees incurred in connection therewith, arising from or connected with, the statements and representations contained herein."

EXECUTED this _____ day of _____, 2019.

NAME OF CONTRACTOR

By: _____
[Name of Company Officer]

Title: _____

CERTIFICATE OF ACKNOWLEDGMENT

Before me, the undersigned authority, on this day personal appeared **[Name of Company Officer]**, who first being duly sworn by me, acknowledged that he/she has the authority to make this Affidavit of All Bills Paid, and further acknowledged to me that he/she executed the same for the purpose and consideration therein expressed and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE on this the _____ day of _____, 20___.

_____
Notary Public in and for the State of Texas