

CITY OF HUNTSVILLE

WALKER COUNTY, TEXAS



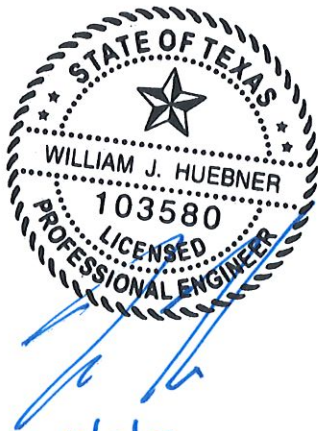
CONTRACT DOCUMENTS AND SPECIFICATIONS FOR THE CONSTRUCTION OF

Project No. 20-10-06
COH Project Name: NB-06 Sanitary Sewer Rehabilitation Project
Bid No. 23-20

CITY OFFICIALS:

Mayor:
Mayor Pro Tem:
Council Members:

Andy Brauningner
Russell Humphrey
Daiquiri Beebe
Deloris Massey
Jon Strong
Lyle Bert
Karen Denman
Vicki McKenzie
Pat Graham



City Manager:
City Engineer:

Aron Kulhavy
Dr. Kathlie S. Jeng-Bullock, P.E.,
D.WRE, CFM

Prepared By:

Prepared For:

Strand Associates, Inc.[®]
1906 Niebuhr Street, Brenham TX 77833
TBPE No. F-8405
TBPLS No. 10030000

City of Huntsville
Engineering Department
448 Highway 75 North, Huntsville, TX 77320

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PART I

NOTICE TO BIDDERS

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NOTICE TO BIDDERS

SEALED BIDS addressed to the Mayor and Council of the City of Huntsville, Texas, will be received at the office of the City Secretary, City Hall, 1212 Avenue M, Huntsville, Texas 77340, until 2:30 p.m. Central Time, Thursday, January 19, 2023, for the purpose of furnishing all supervision, materials, equipment and the performing of all base and alternative bid work required in the construction of the NB-06 Sanitary Sewer Rehabilitation Project #20-10-16, Bid No. 23-20 that includes:

1. Approximately 8,900 linear feet of 6-, 8-, and 10-inch gravity sewer installed by pipe bursting.
2. Approximately 1,125 linear feet of 24- and 30-inch gravity sewer installed by pipe bursting.
3. Approximately 3,125 linear feet of 6- and 8-inch gravity sewer installed by open cut.
4. Removal and replacement of approximately 108 manholes.

And other improvements incidental thereto, at which time and place the proposals will be publicly opened and read aloud and retained for tabulation, checking and evaluation. The opinion of probable cost of the project is \$2,100,000.00 for the Base Bid plus both Alternatives.

BIDS shall be submitted in sealed envelopes upon the blank form furnished herewith. Sealed envelopes shall be marked: “Bid for the NB-06 Sanitary Sewer Rehabilitation Project #20-10-06, Bid No 23-20.”. Do not open until 2:30 p.m. Central Time, Thursday, January 19, 2023.

PRE-BID CONFERENCE – A pre-bid conference (non-mandatory) will be held at 11:00 a.m., Wednesday, January 11, 2023, at the City of Huntsville Service Center, Public Works Conference Room (2nd Floor) at 448 State Highway 75 North, Huntsville, Texas 77320.

PLANS AND SPECIFICATIONS and contract documents may be examined without charge at the following locations:

City Engineer’s Office, City Service Center, 448 State Highway 75 North, Huntsville, Texas 77320
Tel: (936) 294-5794

Strand Associates, Inc.[®], Brenham Office, 1906 Niebuhr Street, Brenham, Texas 77833
Tel: (979) 836-7937

A digital copy in PDF format of all contract Documents may be downloaded from “Bid Opportunities” section of the City of Huntsville website (<http://www.huntsvilletx.gov>).

In case of ambiguity or lack of clearness in stating proposal prices, or in the event of any informality in the bids, the Owner reserves the right to adopt the most advantageous construction thereof, or to reject any or all bids.

Time for beginning and completing the work shall be 270 calendar days from the date given in the “NOTICE TO PROCEED”.

Date

Kristy Doll
City Secretary

Legal Ad Dates: December 31, 2022 and January 7, 2023

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PART II

SPECIAL INSTRUCTIONS TO BIDDERS

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SPECIAL INSTRUCTIONS TO BIDDERS

1. INTRODUCTION:

The City of Huntsville is accepting competitive sealed bids for construction of the **NB-06 Sanitary Sewer Rehabilitation Project #20-10-06, Bid No.23-20** in accordance with Local Government Code Chapter 252. The City of Huntsville is aware of the time and effort you expend in preparing and submitting bids and proposals to the City. Please let us know of any bid requirements which are causing you difficulty in responding to our bids. We want to make the process as easy and painless as possible so that all responsible vendors can compete for the City's business. Information on which commodities and services we purchase or have for sale is available from the Purchasing Office. You may register on the City's vendor management program at www.huntsvilletx.gov/bids to receive notice of bid postings. Additionally, you may register at www.publicpurchase.com

2. GENERAL INSTRUCTIONS:

Bid packets must be delivered to Attention of City Secretary, City of Huntsville 1212 Avenue M, Huntsville, TX 77340. **Responders must include two (2) certified copies of bid sheet (s), Part I thru III.** All questions concerning the bid should be directed in writing to the Procurement Manager (936) 291-5495 or e-mail lgonzalez@huntsvilletx.gov (See attached form).

To obtain bid tabulation results, please log on to our website at: http://www.huntsvilletx.gov/business/bids_and_rfps/bid_opportunities. If you have any other questions, please contact the Procurement Manager at (936) 291-5495 or e-mail lgonzalez@huntsvilletx.gov

3. AWARD AND WITHDRAWAL:

The CITY may consider informal 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 scheduled time for the opening of bids as shown in the "Notice to Bidders" or authorized postponement thereof. No bidder may withdraw a bid within 60 days after the actual date of the opening thereof. The award, if made, will be made to a responsible bidder as recommended by the City Engineer and the City Manager, subject to the decision of the City Council.

4. PREPARATION OF BID:

Each bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and must be fully completed and executed when submitted. In the event words and figures do not agree, the words shall govern and the figures shall be disregarded. If the unit price and the total amount named for an item are not in agreement, the unit price alone will be considered as representing the bidder's intention and the total will be corrected to conform thereto.

Unless otherwise instructed, each bid proposal package shall consist of the Notice to Bidders, Bid Proposal with Bid Sheet(s), Financial Statement, Experience Record, Equipment Schedule, Subcontract Information and any addenda issued for the project.

The bidder must sign their bid in the space provided on the bid form. If the bid is submitted by a partnership or corporation, the name and address of the partnership or corporation must be shown, together with the name and address of the partners or corporate officers. Bids submitted by a partnership must be signed by one of the partners. Bids submitted by a corporation must be signed by one of the corporate officials having, under the corporate structure, the power to act in this capacity and the corporate seal must be affixed onto the bid. Bids submitted by a sole proprietorship must be signed by the proprietor.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, the Bid No. 23-19 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.

Bidders submitting a response do so entirely at their expense. There is no expressed or implied obligation by the City of Huntsville to reimburse any individual or firm for any costs incurred in preparing or submitting a bid, for providing additional information when requested by the City of Huntsville, or for participating in any selection interviews.

5. TELEGRAPHIC MODIFICATION:

Any bidder may modify his bid by letter, telegraphic or other written communication at any time prior to the scheduled closing time for receipt of bids, provided such written communication is received by the CITY prior to the closing time, and provided further, the CITY is satisfied that the written modification bears the signature of the bidder. The written communication should not reveal the 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 CITY until the sealed bid is opened.

6. BID SECURITY:

A CASHIER'S CHECK, certified check or acceptable bidder's bond made payable to the City of Huntsville, Texas in an amount of 5% of the bid submitted must accompany each bid as a guarantee that if awarded the contract, the bidder will enter into a contract and execute such bonds as are required within ten (10) days of award of contract of City Council.

All bid securities will be returned to the respective bidders within thirty (30) days after bids are opened, except those which the CITY elects to hold until the successful bidder has executed the contract. Thereafter all remaining securities, including security of the successful bidder, will be returned.

7. CONTRACT SECURITY:

If the total bid (including all alternates) is less than \$50,000, the contract is not required to provide a payment or performance bond.

If the total bid (including all alternates) is more than \$100,000, then a performance bond is required if the contract provides that payment is not due to the contractor until the work is completed and accepted by the City. The contractor must elect in writing whether the job is to be turnkey or bonded in the contract documents.

If the total bid (including all alternates) is more than \$50,000, then a payment bond is required if the contract provides that payment is not due to the contractor until the work is completed and accepted by the City. The contractor must elect in writing whether the job is to be turnkey or bonded in the contract documents.

For all contracts over \$50,000 where the contractor does not elect to do the work on a turnkey basis, and for all contracts over \$100,000, the successful bidder shall furnish to the City performance and payment bonds in accordance with State law.

Texas Government Code Chapter 2253; Texas Local Government Code Section 271.059; Texas Local Government Code Section 252.044;

8. QUALIFICATION OF BIDDERS:

No prequalification of bidders is required. Before award of any contract can be approved, however, the City shall be satisfied that the bidder involved: (1) maintains a permanent place of business, (2) has adequate plant and equipment to do the work properly and expeditiously, (3) has a suitable financial status to meet obligations incident to the work, (4) has appropriate technical experience, and (5) can submit a satisfactory performance record. Forms are included in the bid proposal for the purpose of supplying the City with such information.

9. WAGE RATES:

Attention is called to the fact that not less than the prevailing wage rates as hereinafter set forth in the CONTRACT DOCUMENTS, which are made a part hereof, must be paid on this project. Texas Government Code Chapter 2258.

10. CONDITIONS OF WORK:

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

11. ADDENDA AND INTERPRETATIONS:

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every question or request for interpretation concerning the solicitation shall be directed to the Procurement Manager, Lucy Gonzalez, in writing via e-mail at lgonzalez@huntsvilletx.gov or sent via mail addressed to the Purchasing Department at 448 SH 75 North, Huntsville, Texas 77320. All questions or request for interpretation must be received by **January 12, 2023 @ 5:00 P.M.** as addressed above. All questions or requests for interpretation concerning the solicitation received after **January 12, 2023 @ 5:00 P.M.** will be considered void and unacceptable.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications, which will be issued and posted on **or before January 16, 2023 @ 5:00 P.M.** on the City of Huntsville website, Public Purchase website and Electronic State Business Daily website. Final interpretations will be made by the City Engineer. All addenda so issued shall become part of the contract documents, and receipt thereof shall be acknowledged in the space provided in the BID PROPOSAL. It is the responsibility of the bidder to verify all addendums and interpretations.

12. POWER OF ATTORNEY:

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

13. LAWS AND REGULATIONS:

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, 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.

14. OBLIGATION OF BIDDER:

At the time of the opening of the bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

15. SAFETY STANDARDS AND ACCIDENT PREVENTION:

With respect to all work performed under this contract, the CONTRACTOR shall:

- (1) Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractor's of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36 No. 75, Saturday, April 17, 1971.
- (2) Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.

- (3) Maintain at his office or other well known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site. In no case shall employees be permitted to work at a job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

16. ALTERNATE ITEMS:

Bid prices for all Alternate Items included by the City in the itemized Bid Schedule shall be completed along with all other items, unless such Alternate Items are indicated as "optional" on the schedule.

17. REJECTION:

The City of Huntsville reserves the right to reject any or all bids for any or all products and/or services covered in this bid request and to waive informalities or defects in bids or to accept such bids as it shall deem to be in the best interests of the City of Huntsville. The City of Huntsville may reject bid for any omission of request forms not limited to the following: insurance, bid bond/or cashier's check, payment and performance bonds, collusion affidavit, responder information, conflict of interest, and signed bid document. If less than three bids are received, the City of Huntsville reserves the right to extend the bid opening date as it deems to be in the best interest of the City. If the awarded vendor is unable to meet the requirements of the City, services/products may be purchased from the best available vendor.

18. REQUIRED FORMS

Each bidder will be required to complete the below forms:

- Conflict of Interest Questionnaire (CIQ)
- Critical Infrastructure Verification
- Firearm Verification
- Certificate of Interested Parties (1295)
- Iran, Sudan and Foreign Terrorist Organizations Verification
- Israel Verification
- Non-Collusion Affidavit
- Prohibition of Contracts Discriminating Against Energy Company Boycott Verification
- Texas Public Information Act Verification
- References

Where applicable, the bidder may complete the following:

- No Bid Statement
- Question/Response

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

FORM CIQ

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

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

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

OFFICE USE ONLY

Date Received

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

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

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

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐

Yes

☐

No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐

Yes

☐

No

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature of vendor doing business with the governmental entity

Date

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

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

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

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

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

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

(2) the vendor:

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

(i) a contract between the local governmental entity and vendor has been executed;

or

(ii) the local governmental entity is considering entering into a contract with the vendor;

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

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

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

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

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

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

(3) has a family relationship with a local government officer of that local governmental entity.

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

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

Critical Infrastructure Verification Form

To the extent this proposal relates to critical infrastructure in the State of Texas, I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company is not owned by or has the majority of stock or other ownership interest held by or controlled by: individuals who are citizens of China, Iran, North Korea, Russia, or a country designed by the Governor of Texas as a threat to critical infrastructure under Section 2274.0103 of the Texas Government Code as amended (“designated country”); or

1. a company or other entity, including a governmental entity, that is owned or controlled by citizens of or is directly controlled by the government of China, Iran, North Korea, Russia, or a designated country; or
2. it is not headquartered in China, Iran, North Korea, Russia, or a designated country.

The foregoing representation is made solely to comply with Chapter 2274 of the Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal or State law. As used in the foregoing verification, “critical infrastructure” means a communication infrastructure system, cybersecurity system, electric grid, hazardous waste treatment system, or water treatment facility.

Date

Signature

:

Firearm Verification Form

I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company, under the provisions of Chapter 2274 of the Texas Government Code, as amended:

1. does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and
2. will not discriminate during the term of the contract against a firearm entity or firearm trade association.

Pursuant to Chapter 2274 and Section 809.001 of the Texas Government Code:

1. “Discriminate against a firearm entity or firearm trade association” means, with respect to the entity or association, to: (i) refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; (ii) refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or (iii) terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association.
2. “Company” means a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exist to make a profit.

Date

Signature

EXCLUSION FROM CHAPTER 2274 OF THE TEXAS GOVERNMENT CODE

I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company is excluded from Chapter 2274 because the contract in question:

- ☐ will be between a governmental entity and a company with fewer than 10 full-time employees,
- ☐ will have a value of less than \$100,000 that is to be paid wholly or partly from public funds of the governmental entity;
- ☐ will be between a governmental entity and a sole proprietor; or
- ☐ is an exempt contract under Section 2274.003 of the Texas Government Code.

Please check exceptions, if any, that apply to the potential contract between New Braunfels Utilities and the Company.

Date

Signature

Certificate of Interested Parties Form (Form 1295)

Pursuant to Section 2252 of the Texas Government Code, any business entity entering into a contract with a local government that requires approval of the governing body must submit a Disclosure of Interested Parties to the local government prior to the execution of the contract. The Texas Ethics Commission (TEC) has adopted a form for the Disclosure of Interested Parties (Form 1295) and has created a website application for business entities to submit the required information.

The City of Huntsville may not enter into a contract that requires the approval of the City Council until the business entity that is a party to the contract files a Form 1295 with the Texas Ethics Commission and the City of Huntsville Purchasing Department.

- 1.** Upon being notified of a bid/recommended award, the award recipient, the business entity, must go the following website: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm and follow the login directions on the website application to complete a Form 1295. If this is a business entity's first-time login on to the website application, the business entity must create a login Username and Password then follow the application's instructions to complete a Form 1295.
- 2.** The City does not have a Contract ID Number System. Please insert the City of Huntsville's bid or project number in this box.
- 3.** Once confirmation is received, that the information has been submitted with the Texas Ethics Commission, the business entity **MUST** print, sign and date Form 1295.
- 4.** Form 1295 must be filed with the Texas Ethics Commission within seven (7) business days of the date of notification of recommended award. The contract will not be presented to City Council until the form has been filed with the Texas Ethics Commission and the City of Huntsville has received Form 1295.
- 5.** In no way does a request for filing of Form 1295 with the Texas Ethics Commission commit the City to any type of award whatsoever.
- 6.** Once the City of Huntsville Purchasing Department receives Form 1295, the Purchasing Department will submit confirmation of receipt through the Texas Ethics Commission website within thirty (30) days.
- 7.** This process must be followed for each contract requiring City of Huntsville Council approval.
- 8.** A Form 1295 cannot be handwritten. It must be completed electronically through the Texas Ethics Commission website application.

If you have any questions contact the City of Huntsville Procurement Manager at (936) 291-5495, City Service Center, 448 SH 75 N, Huntsville, TX 77320.

SB-11

Iran, Sudan and Foreign Terrorist Organizations Verification Form

I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company, under the provisions of Chapter 2252 of the Texas Government Code, as amended:

1. will not do business with Iran, Sudan, or any foreign terrorist organization; and
2. will not do business with Iran, Sudan, or any foreign terrorist organization during the term of the contract.

Date

Signature

Israel Verification Form

I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company, under the provisions of Chapter 2271 of the Texas Government Code, as amended:

1. does not boycott Israel currently; and
2. will not boycott Israel during the term of the contract.

Pursuant to Section 2271.001 of the Texas Government Code:

1. “Boycott Israel” means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and
2. “Company” means a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exist to make a profit.

Date

Signature

EXCLUSION FROM CHAPTER 2271 OF THE TEXAS GOVERNMENT CODE

I, _____, the undersigned representative of _____ (the “Company”) do hereby declare, represent, and verify that the Company is excluded from Chapter 2271 because the contract in question:

- ☐ will be between a governmental entity and a company with fewer than 10 full-time employees;
- ☐ will have a value of less than \$100,000 that is to be paid wholly or partly from public funds of the governmental entity; or
- ☐ will be between a governmental entity and a sole proprietor.

Please check exceptions, if any, that apply to the potential contract between New Braunfels Utilities and the Company.

Date

Signature

Non-Collusion Affidavit

1. He/she is _____ of _____, the responder that has submitted the attached bid/proposal.
2. He/she is fully informed respecting the preparation of contents of the attached bid and of all pertinent circumstances respecting such bid/proposal.
3. Such bid is genuine and is not collusive or a sham bid/proposal.
4. Neither the said responder nor any of its officer, partners, owners, agents, representative, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived or agreed, directly or indirectly with another responder, firm or person to submit a collusive or sham bid in connection with the contract for which the attached bid has been submitted or to refrain from responding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement of collusion or communication or conference with any other responder, firm or person to fix the price or prices in the attached bid or of any other responder, or to fix an overhead, profit or cost element of the bid price of the bid price of any other responder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Huntsville or any per interest in the proposed contract.
5. In compliance with the specifications in the bid/proposal and quote conditions, I, the undersigned agree to furnish the services upon which prices are offered at the price opposite to each line description to the City of Huntsville within the time specified. By submitting this bid/proposal and attached signature I hereby attest that I have not received nor offered anything of value to any City employee, official, and/or board member in connection with this submitted bid.
6. Advanced disclosures of any information to any particular/potential responder which gives that particular/potential responder any advantage over any other interested responder in advance of the award whether in response to advertising or an informal request for bid/proposal made or permitted by a member of the governing body or an employee or representative thereof, will cause to void that particular responders bid/proposal. Prior to an award any communication with a member of the selection committee or governing board will cause to void that particular responders bid/proposal and the committee member or the governing board member will be rejected from the voting process for that bid/proposal or contract. By submission of this bid/proposal responder attests that no improper communication has occurred resulting in an advantage over any other responder, potential responder, or advance discloser.
7. The price or prices quoted in the attached bid/proposal are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the responder or any of its agents, representative, owners, employees, or parties in interest, including this affidavit.

Signature

Printed Name

Firm Name

Prohibition of Contracts Discriminating Against Energy Company Boycott Verification Form

I, _____, the undersigned representative of _____ (the "Company") do hereby declare, represent, and verify that the Company, under the provisions of Chapter 2274 of the Texas Government Code, as amended:

1. does not boycott energy companies currently; and
2. will not boycott energy companies during the term of the contract.

Pursuant to Chapter 2274 and Section 809.001 of the Texas Government Code:

1. "Boycott energy company" means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by Paragraph (A).
2. "Company" means a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exist to make a profit.

Date

Signature

EXCLUSION FROM CHAPTER 2274 OF THE TEXAS GOVERNMENT CODE

I, _____, the undersigned representative of _____ (the "Company") do hereby declare, represent, and verify that the Company is excluded from Chapter 2274 because the contract in question:

- ☐ will be between a governmental entity and a company with fewer than 10 full-time employees;
- ☐ will have a value of less than \$100,000 that is to be paid wholly or partly from public funds of the governmental entity; or
- ☐ will be between a governmental entity and a sole proprietor.

Please check exceptions, if any, that apply to the potential contract between New Braunfels Utilities and the Company.

Date

Signature

Texas Public Information Act Verification Form

I, _____, the undersigned representative of _____ (the “Company”) do hereby acknowledge that the requirements of Subchapter J, Chapter 552, Government Code, may apply to this solicitation, proposal and any resultant contract, and agree that the contract can be terminated if the contractor or vendor knowingly or intentionally fails to comply with a requirement of that subchapter.

Date

Signature

References:

Responders shall submit with the bid the name, address, telephone number, and point of contact of at least three (3) companies for which the responder has done business within the preceding twelve (12) months. References may be checked prior to award. Any negative responses received may result in disqualification of the bid.

Reference 1

COMPANY NAME :

CONTACT :

ADDRESS :

PHONE # :

Reference 2

COMPANY NAME :

CONTACT :

ADDRESS :

PHONE # :

Reference 3

COMPANY NAME :

CONTACT :

ADDRESS :

PHONE # :

No Bid Statement

Bid Name: **NB-06 Sanitary Sewer Rehabilitation**

Project # 20-10-06

Bid Number: **23-20**

Responders Name:_____

The City of Huntsville seeks to evaluate the level of competitiveness provided. Please complete this form only if you are not submitting a quote.

Please check the appropriate boxes indicating the factors considered for not bidding.

- ☐ Unable to respond to the request for bid or request for proposals by the specific deadline.
- ☐ Our company does not carry or cannot offer this type of product and service.
- ☐ Specifications are restrictive, unclear or incomplete. Please explain below

- ☐ Invitation is suitable, but engaged in other work.
- ☐ Do not wish to do business with the City.

The purpose of this form is to achieve a maximum participation in the bidding process. Vendor comments are not restrictive to the above described. Please make any statement that may have impacted your ability to bid.

Question/Response Form

Responders are encouraged to ask questions to gain clarification. Only questions submitted in writing on or before [redacted], 202[redacted] and addressed to the City of Huntsville Purchasing Department will be answered. Responders are asked to use this form for questions. The Purchasing Department will gain a response and reply via e-mail and all questions with responses may be posted on the City of Huntsville website. All responders are encouraged to check the website under FAQ prior to posting a question. Any question received after [redacted], 20[redacted] may not be answered.

Please only use one question per form. For additional questions please use another form.

Responders Name: _____

Responses will be sent either fax or e-mail:

Responders Fax #: _____

Responders E-mail address: _____

Question: _____

Response: _____

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PART III

BID PROPOSAL & BID BOND

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BID PROPOSAL
(THIS PROPOSAL MUST NOT BE REMOVED FROM THE CONTRACT DOCUMENTS)

DATE _____

TO: The Honorable Mayor and City Council
of the City of Huntsville, Texas

FOR THE CONSTRUCTION OF: **NB-06 Sanitary Sewer Rehabilitation Project #20-10-06**
Bid No. 23-20

Pursuant to the foregoing "Notice to Bidders", the undersigned, as bidder declares that the only person or parties interested in this proposal as principals are those named herein, that this proposal is made without collusion with any other person, firm, or corporation; that he has carefully examined the form of contract, Notice to Contractors, specifications, and the plans therein referred to, and has carefully examined the locations, conditions and classes of materials of the proposed work; and agrees that he will provide all the necessary labor, machinery, tools, apparatus, and other items incidental to construction, and will do all the work and furnish all the materials called for in the contract and specifications in the manner prescribed therein and according to the requirements of the Owner as therein set forth.

It is understood that the following quantities of work to be done at unit prices are approximate only, and are intended principally to serve as a guide in evaluating bids.

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

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

It is understood and agreed that the work is to be completed in full within 270 calendar days from the date given in the "Notice to Proceed".

It is understood that this bid may not be withdrawn within 60 days after the actual date of the opening thereof.

Accompanying this proposal is a certified or Cashier's check or Bidder's Bond payable to the OWNER for _____ Dollars (\$ _____), (not less than five (5) percent of the total amount bid.)

The bid security accompanying this proposal shall be returned to the bidder, unless in case of the acceptance of the proposal the bidder shall fail to execute a contract and file a performance bond and a payment bond within ten days after its acceptance, in which case the bid security shall become the property of the OWNER, and shall be considered as payment for damages due to delay and other inconveniences suffered by the OWNER on account of such failure of the bidder. It is understood that the OWNER reserves the right to reject any and all bids.

The undersigned bidder hereby proposes to do the following work at the following prices:

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BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
BASE BID						
1	Furnish and install 6-inch high density polyethylene (HDPE) dimension ratio (DR)-11 by pipe bursting. Complete and In-Place	3,030	LF			and _____/100ths Dollars.
2	Furnish and install 8-inch HDPE DR-11 by pipe bursting. Complete and In-Place	748	LF			and _____/100ths Dollars.
3	Furnish and install 10-inch HDPE DR-11 by pipe bursting. Complete and In-Place	80	LF			and _____/100ths Dollars.
4	Remove and dispose of the existing sanitary sewer pipe and install a 6-inch American Society for Testing and Materials (ASTM) D3034 SDR 26 sanitary sewer pipe, open cut, depth 0 to 6 feet. Complete and In-Place	75	LF			and _____/100ths Dollars.
5	Remove and dispose of the existing sanitary sewer pipe and install a 8-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut, depth 0 to 6 feet. Complete and In-Place	350	LF			and _____/100ths Dollars.
6	Remove and dispose of the existing sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut, depth 6 to 8 feet. Complete and In-Place	610	LF			and _____/100ths Dollars.
7	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut, depth 8 to 10 feet. Complete and In-Place	1,344	LF			and _____/100ths Dollars.

Name of Company Submitting
 Bid: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
8	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut, depth 10 to 12 feet. Complete and In-Place	358	LF			and _____/100ths Dollars.
9	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut, depth 12 to 14 feet. Complete and In-Place	38	LF			and _____/100ths Dollars.
10	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe inside a 12-inch HDPE casing, open cut, depth 10 to 12 feet. Complete and In-Place	135	LF			and _____/100ths Dollars.
11	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe stub out at manholes, open cut, all depths. Complete and In-Place	20	LF			and _____/100ths Dollars.
12	Remove and dispose of the existing 6-inch sanitary sewer pipe and install a 6-inch ASTM D3034 SDR 26 sanitary sewer pipe stub out at manholes, open cut, all depths. Complete and In-Place	55	LF			and _____/100ths Dollars.
13	Install 6-inch drop connection into manhole. Complete and In-Place	1	EA			and _____/100ths Dollars.
14	Make a 6-inch connection to the existing 6-inch sanitary sewer line. Complete and In-Place	2	EA			and _____/100ths Dollars.
15	Make a 6-inch sanitary sewer connection to the existing manhole. Complete and In-Place	3	EA			and _____/100ths Dollars.
16	Make an 8-inch sanitary sewer connection to the existing manhole. Complete and In-Place	1	EA			and _____/100ths Dollars.

Name of Company Submitting

Bid: _____



BID SHEET

Project No.: 20-10-06

Project Name: **NB-06 Sanitary Sewer Rehabilitation Project**

Bid No. 23-20

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
17	Remove and dispose of the existing mainline cleanout and install new mainline cleanout, valve box, and cover, all sizes. Complete and In-Place	2	EA			and _____/100ths Dollars.
18	Remove and dispose of the existing manholes. Complete and In-Place	50	EA			and _____/100ths Dollars.
19	Furnish and install new flat top, 4-foot-diameter, precast concrete manhole with vent pipe with composite frame and cover. Complete and In-Place	1	EA			and _____/100ths Dollars.
20	Furnish and install new 4-foot-diameter, precast concrete manholes with composite frame and cover. Complete and In-Place	41	EA			and _____/100ths Dollars.
21	Furnish and install new 5-foot-diameter, precast concrete manholes with composite frame and cover. Complete and In-Place	9	EA			and _____/100ths Dollars.
22	Furnish all materials to perform asphalt repair (including base material). Complete and In-Place	350	LF			and _____/100ths Dollars.
23	Furnish all materials to perform concrete repair (including base material). Complete and In-Place	16	LF			and _____/100ths Dollars.
24	Sanitary sewer bypass pumping. Complete and In-Place	1	LS			and _____/100ths Dollars.
25	Install and maintain temporary erosion control devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
26	Install and maintain trench safety; 5 to 10 feet. Complete and In-Place	2,622	LF			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 20-10-06

Project Name: **NB-06 Sanitary Sewer Rehabilitation Project**

Bid No. 23-20

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
27	Install and maintain trench safety; greater than 10 feet. Complete and In-Place	413	LF			and _____/100ths Dollars.
28	Maintain traffic control according to the Texas Manual on Uniform Traffic Control Devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
29	Seed all disturbed areas. Complete and In-Place	1	LS			and _____/100ths Dollars.
30	Cash Allowance–Rent and Mobilize dewatering equipment to perform dewatering in accordance with the Specification Section 31 23 19-Dewatering. Complete and In-Place	1	LS	\$32,500.00	\$32,500.00	Thirty-Two Thousand, Five-Hundred and 00/100ths Dollars.

TOTAL BASE BID

\$ _____

**Total written
in words:**

and _____/100ths Dollars

OPEN AND READ ALOUD

By: _____

Dated: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
ALTERNATE BID NO. 1						
A1.1	Furnish and install 6-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	1,955	LF			and _____/100ths Dollars.
A1.2	Furnish and install 8-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	305	LF			and _____/100ths Dollars.
A1.3	Furnish and install 10-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	990	LF			and _____/100ths Dollars.
A1.4	Furnish and install 30-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	790	LF			and _____/100ths Dollars.
A1.5	Remove and dispose of the existing 30-inch santiary sewer pipe and install a 30-inch ASTM F679 SDR 26 sanitary sewer pipe, open cut, all depths. Complete and In-Place	10	LF			and _____/100ths Dollars.
A1.6	Remove and dispose of the existing 24-inch santiary sewer pipe and install a 24-inch ASTM F679 SDR 26 sanitary sewer pipe, open cut, all depths. Complete and In-Place	10	LF			and _____/100ths Dollars.
A1.7	Remove and dispose of the existing 10-inch santiary sewer pipe and install a 10-inch ASTM D3034 SDR 26 sanitary sewer pipe, open cut,all depths. Complete and In-Place	10	LF			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
A1.8	Remove and dispose of the existing 8-inch sanitary sewer pipe and install an 8-inch ASTM D3034 SDR 26 sanitary sewer pipe stub out at manholes, open cut, all depths. Complete and In-Place	5	LF			and _____/100ths Dollars.
A1.9	Remove and dispose of the existing 6-inch sanitary sewer pipe and install a 6-inch ASTM D3034 SDR 26 sanitary sewer pipe stub out at manholes, open cut, all depths. Complete and In-Place	125	LF			and _____/100ths Dollars.
A1.10	Make a 6-inch sanitary sewer connection to the existing manhole. Complete and In-Place	1	EA			and _____/100ths Dollars.
A1.11	Make a 8-inch sanitary sewer connection to the existing manhole. Complete and In-Place	1	EA			and _____/100ths Dollars.
A1.12	Remove and dispose of the existing mainline cleanout and install new mainline cleanout, valve box, and cover, all sizes. Complete and In-Place	5	EA			and _____/100ths Dollars.
A1.13	Remove and dispose of the existing manholes. Complete and In-Place	44	EA			and _____/100ths Dollars.
A1.14	Furnish and install new 4-foot-diameter, precast concrete manholes with composite frame and cover. Complete and In-Place	41	EA			and _____/100ths Dollars.
A1.15	Furnish and install new 5-foot-diameter, precast concrete manholes with composite frame and cover. Complete and In-Place	3	EA			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
A1.16	Sanitary sewer bypass pumping. Complete and In-Place	1	LS			and _____/100ths Dollars.
A1.17	Install and maintain temporary erosion control devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
A1.18	Maintain traffic control according to the Texas Manual on Uniform Traffic Control Devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
A1.19	Furnish all materials to perform asphalt repair (including base material). Complete and In-Place	100	LF			and _____/100ths Dollars.
A1.20	Seed all disturbed areas. Complete and In-Place	1	LS			and _____/100ths Dollars.

TOTAL ALTERNATE NO. 1

\$ _____

**Total written
in words:**

and _____/100ths Dollars

OPEN AND READ ALOUD

By: _____

Dated: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
ALTERNATE BID NO. 2						
A2.1	Furnish and install 6-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	1,445	LF			and _____/100ths Dollars.
A2.2	Furnish and install 24-inch HDPE SDR-11 by pipe bursting. Complete and In-Place	327	LF			and _____/100ths Dollars.
A2.3	Remove and dispose of the existing 30-inch sanitary sewer pipe and install a 30-inch ASTM F679 SDR 26 sanitary sewer pipe, open cut, all depths. Complete and In-Place	15	LF			and _____/100ths Dollars.
A2.4	Remove and dispose of the existing 6-inch sanitary sewer pipe and install a 6-inch ASTM D3034 SDR 26 sanitary sewer pipe stub out at manholes, open cut, all depths. Complete and In-Place	15	LF			and _____/100ths Dollars.
A2.5	Make a 6-inch sanitary sewer connection to the existing manhole. Complete and In-Place	1	EA			and _____/100ths Dollars.
A2.6	Remove and dispose of the existing mainline cleanout and install new mainline cleanout, valve box, and cover, all sizes. Complete and In-Place	1	EA			and _____/100ths Dollars.
A2.7	Remove and dispose of the existing manholes. Complete and In-Place	13	EA			and _____/100ths Dollars.
A2.8	Furnish and install new 4-foot-diameter, precast concrete manholes with composite frame and cover. Complete and In-Place	13	EA			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 20-10-06

Bid No. 23-20

Project Name: NB-06 Sanitary Sewer Rehabilitation Project

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
A2.9	Sanitary sewer bypass pumping. Complete and In-Place	1	LS			and _____/100ths Dollars.
A2.10	Install and maintain temporary erosion control devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
A2.11	Maintain traffic control according to the Texas Manual on Uniform Traffic Control Devices. Complete and In-Place	1	LS			and _____/100ths Dollars.
A2.12	Furnish all materials to perform asphalt repair (including base material). Complete and In-Place	50	LF			and _____/100ths Dollars.
A2.13	Seed all disturbed areas. Complete and In-Place	1	LS			and _____/100ths Dollars.

TOTAL ALTERNATE NO. 2

\$ _____

**Total written
in words:**

and _____/100ths Dollars

OPEN AND READ ALOUD

By: _____

Dated: _____

Name of Company Submitting
Bid: _____

In the event of the award of a contract to the undersigned, the undersigned will furnish a performance bond and a payment bond, each for the full amount of the contract, to secure proper compliance with the terms and provisions of the contract, to insure and guarantee the work until final completion and acceptance, and to guarantee payment of all lawful claims for labor performed and materials furnished in the fulfillment of the contract.

The work proposed to be done shall be accepted when fully completed and finished in accordance with the plans and specifications, to the satisfaction of the OWNER.

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

NOTE: Unit and lump sum prices must be shown in words and figures for each item listed in this proposal, and in the event of discrepancy, the words shall control. Should bid prices on any items be omitted, the right is reserved to apply the lowest prices submitted by any other bidders for the omitted items in payment for work done under this proposal.

Receipt is hereby acknowledged of the following addenda to the contract documents:

Addendum No. _____ dated _____ Received
Addendum No. _____ dated _____ Received
Addendum No. _____ dated _____ Received
Addendum No. _____ dated _____ Received
Addendum No. _____ dated _____ Received

Contractor Name: _____

Signed _____

By: _____
(Print Name)

(Title)

(Street Address)

(City and State)

Telephone No: () _____

E-mail address: _____

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

Notary Public in and for the State of Texas

FINANCIAL STATEMENT

Condition of Bidder at close of business month, _____, 20____

ASSETS

1.	Cash on hand	\$ _____	
	In Bank	\$ _____	
	Elsewhere	\$ _____	
2.	Accounts receivable from completed contracts (exclusive of claims not approved for payment.)	\$ _____	
3.	Accounts receivable from other sources than above.	\$ _____	
4.	Amount earned on uncompleted contracts (not included in Item 3) (Contract price on completed portion of un-completed contracts less total cost of completed portion.)	\$ _____	
5.	Deposits for bids on other guarantees.	\$ _____	
6.	Notes Receivable Past Due	\$ _____	
	Due 90 days	\$ _____	
	Due later	\$ _____	\$ _____
7.	Interest earned		\$ _____
8.	Real Estate Business Property, present value	\$ _____	
	Other property, present value	\$ _____	\$ _____
9.	Stocks and Bonds, listed on Exchange	\$ _____	
	Unlisted	\$ _____	\$ _____
10.	Equipment, machinery, Fixtures	\$ _____	
	Less depreciation	\$ (_____)	\$ _____
11.	Other Assets		\$ _____
	TOTAL ASSETS		\$ _____

LIABILITIES AND NET WORTH

1.	Notes Payable to Banks Regular	\$ _____	
	(For Certified Checks)	\$ _____	
	Equipment Obligations	\$ _____	
	Others	\$ _____	\$ _____
2.	Accounts Payable Current	\$ _____	
	Past Due	\$ _____	\$ _____
3.	Real Estate Mortgages		\$ _____
4.	Other Liabilities		\$ _____
5.	Reserves		\$ _____
6.	Capital Stock Paid Up		
	Common	\$ _____	
	Preferred	\$ _____	\$ _____
7.	Surplus		\$ _____
	TOTAL LIABILITIES		\$ _____

EXPERIENCE RECORD

List of projects your organization has successfully completed (list at least three (3)).

<u>Amount of Contract Award</u>	<u>Type of Work</u>	<u>Date Accepted</u>	<u>Name and Address of Owner</u>

List of projects your organization is now engaged in completing:

<u>Amount of Contract Award</u>	<u>Type of Work</u>	<u>Anticipated Date of Completion</u>	<u>Name and Address of Owner</u>

List of Performance Bonds in force on above uncompleted work:

<u>Amount of Contract Award</u>	<u>Type of Work</u>	<u>Amount of Bond</u>	<u>Name and Address of Owner</u>

EQUIPMENT SCHEDULE

List of equipment owned by bidder that is in serviceable condition and available for use:

SUBCONTRACT INFORMATION

Portions of work bidder proposes to sublet in case of Award of Contract including amount and type:

<u>Subcontractor's</u> <u>Name</u>	<u>Address</u>	<u>Type of Work</u> <u>to be Performed</u>	<u>% of</u> <u>Total</u> <u>Contract</u>

BONDING COMPANY INFORMATION

The following person, firm or corporation has agreed to execute the required payment and performance bond in the event this contract is awarded to the bidder:

Name of Surety: _____

Mailing Address: _____

City, State & Zip: _____

Telephone Number: _____

Is Surety Authorized to Operate in Texas: _____

Is Surety aware of the size of the Project: _____

Does the surety have adequate authorization and resources to cover bonds for the amount of this contract? _____

Rating from Best's Key Rating Guide: _____

Project Name: _____

Project Number: _____

Owner's Name: _____ City of Huntsville, Texas

Owner's Address: _____ 1212 Avenue M, Huntsville, Texas 77340

Name of Bidder (company name)

By: _____
Signature

Print Name: _____

Date: _____

BID BOND

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

BIDDER (Name and Address):

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

OWNER (Name and Address):

BID

Bid Due Date:

Project (Brief Description Including Location):

BOND

Bond Number:

Date (Not later than Bid due date):

Penal Sum: _____ (Words) _____ (Figures)

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

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder any difference between the total amount of Bidder's Bid and the total amount of the Bid of the next lowest, responsible Bidder who submitted a responsive Bid as determined by Owner for the work required by the Contract Documents, provided that:

1.1. If there is no such next Bidder, and Owner does not abandon the Project, then Bidder and Surety shall pay to Owner the penal sum set forth on the face of this Bond, and

1.2. In no event shall Bidder's and Surety's obligation hereunder exceed the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2. All Bids are rejected by Owner, or

3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced

only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PART IV

AGREEMENT AND BONDS

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STANDARD FORM OF AGREEMENT

STATE OF TEXAS §
COUNTY OF WALKER §

This AGREEMENT, made by and between the CITY OF HUNTSVILLE, TEXAS a municipal corporation of the County of Walker and State of Texas, acting through its City Manager, Aron Kulhavy, thereunto duly authorized so to do, hereinafter termed "OWNER," and _____ (address) _____, hereinafter termed "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed, and under the conditions expressed in the bond bearing even date herewith, the CONTRACTOR, hereby agrees with the OWNER to commence and complete the construction of certain improvements described as follows:

Project No. 20-10-06
Project Name: NB-06 Sanitary Sewer Rehabilitation Project

and all extra work in connection therewith, under the terms as stated in the General Conditions of the Agreement and at his (or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction, in accordance with the conditions and prices stated in the Proposal attached hereto, and in accordance with the Notice to Bidders, General and Special Conditions of Agreement, Technical Specifications, Plans and other drawings and printed or written explanatory matter hereof, and the Specifications and addenda therefor, as prepared by the City Engineer, herein entitled the ENGINEER, each of which has been identified by the CONTRACTOR and the agreement, and the Performance and Payment Bonds hereto attached; all of which are made a part hereof and collectively evidence and constitute the entire contract.

The CONTRACTOR hereby agrees to commence work on the date specified in the written "Notice to Proceed" from the City, and to substantially complete the same within two hundred seventy (270) calendar days from the date given in the "Notice to Proceed," subject to such extensions of time as are provided by the General and Special Conditions.

The Owner pursuant to this Contract will be represented by the City Engineer, herein sometimes referred to as the Owner's representative, who has the authority to act for the Owner with regard to this Contract.

The Owner shall retain 5% of the total Contract price until all inspections, including TDLR/ADA inspections (if applicable) have been completed, approved, and accepted by the respective agencies to insure compliance by the contractor for Owner.

The OWNER agrees to pay the CONTRACTOR in current funds the price or prices shown in the proposal, which forms a part of this contract, such payments to be subject of the General and Special Conditions of the contract.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement. This Agreement will be effective as of the date last signed and dated by the parties below.

City of Huntsville, Texas
(OWNER)

(CONTRACTOR)

By: _____
Aron Kulhavy, City Manager

By: _____

Date: _____

Printed Name: _____

Date: _____

ATTEST: _____
Kristy Doll, City Secretary

ATTEST: _____

Date: _____

Date: _____

Approved by Council: _____

Approved as to form:

Leonard Schneider, City Attorney

PAYMENT BOND

Bond No. _____

THE STATE OF TEXAS

§

KNOW ALL BY THESE PRESENTS:

§

COUNTY OF _____

§

That we, _____, as Principal herein, and _____, a corporation organized and existing under the laws of the State of Texas and who is authorized and admitted to use surety bonds in the State of Texas, as surety, are held and firmly bound unto the **City of Huntsville, Texas** so located in **Walker County, Texas**, Obligee herein, in the amount of _____ Dollars (\$_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

WHEREAS, the Principal has entered into a certain written contract with the Obligee dated the _____ day of _____, 20____, which contract is hereby referred to herein as "the Contract" and is incorporated herein to the same extent as if copied at length, for the following project: **#20-10-06, NB-06 Sanitary Sewer Rehabilitation Project**.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall directly or indirectly timely make payment to each and every claimant (as defined in Chapter 2253, Texas Government Code, as amended) supplying labor or materials in the prosecution of the work under the Contract, then this obligation shall be void; otherwise, to remain in full force and effect. *This obligation may be enforced by the Obligee in the event of bankruptcy or default by Principal in payments to suppliers of labor or materials in the prosecution of the work under the Contract, in either of which events the Surety shall make such payments as Principal has failed to pay and as may be required to complete the work under the contract.* The Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to the terms of the Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to the Contract or to related subcontracts, purchase orders or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto.

Bond No. _____

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of the Texas Government Code, as amended, and all rights and liabilities on this bond shall be determined in accordance with the provisions of said statute, to the same extent as if it were copied at length herein. All notices shall be delivered in writing to the addresses shown below or to addresses provided in the Contract Documents.

The Resident Agent of the Surety in _____ County , Texas, for delivery

Name: _____

Street: _____

City, State, ZIP: _____

of notice and service of the process is:

For additional information on the above named Surety Company you may contact the Texas Department of Insurance at (800)578-4677.

[SIGNATURE PAGES TO FOLLOW]

NOTE: Payment Bond shall not be prior to the date ***of Contract***. If Resident Agent is not a corporation, give a person's name.

Bond No. _____

IN WITNESS WHEREOF, the duly authorized representatives of the Principal and the Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20____.

PRINCIPAL NAME

ATTEST:

By: _____

(Principal) Secretary

Print Name: _____

Print Name: _____

Title: _____

(S E A L)

Address: _____

Telephone Number: _____

Witness as to Principal

Print Name: _____

Bond No. _____

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

SURETY NAME

ATTEST:

By: _____

(Principal) Secretary

Print Name: _____
Attorney in Fact

Print Name: _____

(S E A L)

Address: _____

Witness as to Surety

Telephone Number: _____

Print Name: _____

Approved as to Form:

City of Huntsville

By: _____
Leonard Schneider

Title: City Attorney

Date: _____

PERFORMANCE BOND

Bond No. _____

THE STATE OF TEXAS

§

KNOW ALL BY THESE PRESENTS:

§

COUNTY OF _____

§

That we, _____ [Contractor], as Principal herein, and _____ [Surety], a corporation organized and existing under the laws of the State of _____ and who is authorized and admitted to issue surety bonds in the State of Texas, Surety herein, are held and firmly bound unto the **City of Huntsville, Texas**, located in **Walker County, Texas**, Obligees herein, in the sum of _____ Dollars (\$ _____) for the payment of which sum we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a certain written contract with the Obligees dated the _____ day of _____, 20____, herein referred to as “the Contract” and incorporated herein and made a part hereof for all purposes, for the construction of the following project: **#20-10-06, NB-06 Sanitary Sewer Rehabilitation Project**.

NOW, THEREFORE, the condition of this obligation is such, if the said Principal shall faithfully perform the work in accordance with the plans, specifications, and other Contract Documents and shall fully indemnify and hold harmless the Obligees from all costs and damages which Obligees may suffer by reason of Principal’s failure to perform the Work in conformity with the Contract Documents, and reimburse and repay Obligees for all outlay and expense that Obligees may incur in making good such default, then this obligation shall be void; otherwise, to remain in full force and effect.

Whenever Principal shall be declared by Obligees to be in default under the Contract, the Surety shall, upon request of Obligees and within ten (10) calendar days from receipt of Obligees’ notice of Principal’s default, commence and thereafter complete performance of Contractor’s obligations under the Contract. Surety acknowledges that its obligations under this bond and as detailed herein and in the Contract Documents are not conditioned on a termination of the Principal by the Obligees. Surety further acknowledges and agrees that Surety shall obtain the Obligees’ approval and consent with respect to the contractor(s) that Surety may retain to replace defaulted Principal or otherwise honor the obligations under this Bond.

Bond No. _____

This Bond covers all contractual obligations of Contractor under the Contract, including, without limitation, the indemnity, warranty and guaranty obligations. The Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to the terms of any of the Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to the Contract or to related subcontracts, purchase orders or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto. The penal limit of this bond shall automatically be increased by the amount of any change order, supplemental agreement or amendment which increases the price of the Contract.

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of the Texas Government Code, as amended, and all rights and liabilities on this bond shall be determined in accordance with the provisions of such statute, to the same extent as if it were copied at length herein. All notices shall be delivered in writing to the addresses shown below or to addresses provided in the Contract Documents.

The Resident Agent of the Surety in _____ County , Texas, for delivery

Name: _____
Street: _____
City, State, ZIP: _____

of notice and service of the process is:

For additional information on the above named Surety Company you may contact the Texas

Department of Insurance at (800)578-4677.

[SIGNATURE PAGES TO FOLLOW]

NOTE: Performance Bond shall not be prior to the date **of Contract**. If Resident Agent is not a corporation, give a person's name.

Bond No. _____

IN WITNESS WHEREOF, the duly authorized representatives of the Principal and the Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20__.

PRINCIPAL NAME

ATTEST:

By: _____

(Principal) Secretary

Print Name: _____

Print Name: _____

Title: _____

(S E A L)

Address: _____

Telephone Number: _____

Witness as to Principal

Print Name: _____

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

SURETY NAME

ATTEST:

By: _____

Secretary

Print Name: _____

Attorney in Fact

Print Name: _____

Address: _____

(S E A L)

Witness as to Surety

Telephone Number: _____

Print Name: _____

Bond No. _____

Approved as to Form:

City of Huntsville, Texas

By: _____
Leonard Schneider

Title: City Attorney

Date: _____

MEMORDANDUM

Certificate of Insurance Explanations and Summary Requirements

To: Consultants / Contractors
Prepared by: Engineering Department, City of Huntsville, Texas

This memorandum addresses standardizing the City of Huntsville's requirements for Certificates of Insurance, to facilitate the processing of Professional Services and Construction Contracts. It is recommended that the following information be reviewed by Consultants / Contractors to insure complete Certificates of Insurance are provided as part of the contracting process. A sample insurance form is attached, matching the numbered listings provided below:

1. Certificate must not be more than 12 months old.
2. Name and address of producer writing coverage.
3. Name of insurance company providing coverage as listed in Best's Key Rating Guide or on Company's Certificate of Authority on file with Texas Department of Insurance. Company must have rating of B+ or better; provided, however, that this requirement will be waived for workers compensation coverage if the coverage is placed with a company that participates in the State of Texas Workers' Compensation Assigned Risk Pool.
4. Name and address of insured, as shown on policy.
5. Must reference the insurer of the policy being described.
6. Must be a policy number, no binders.
7. Date policy became effective.
8. Expiration date must be at least 60 days from date of deliver of certificate.
9. Check limits of liability against contract.
10. Must check either; 1) Any Auto, or 2) All Owned, Hired, and Non-Owned Autos.
11. Statutory limits must be checked per our ordinance.
12. Must name the City as Additional Insured on Commercial General Liability and Automobile Liability. Must have a Waiver of Subrogation in favor of the City on Commercial General Liability, Automobile Liability, and Workers' Compensation/Employers' Liability.
13. Name and file number of project.
14. Address of the City of Huntsville and the name of the project manager or City Engineer.
15. Cancellation clause of the underlying policy must be endorsed to provide that, "should any of the above described policies be canceled before the expiration date thereof, the issuing company will mail 30 days written notice to the certificate holder named."
16. Signature or facsimile signature of authorized representative of producer.

UNLESS OTHERWISE SPECIFIED:

Minimum Insurance Requirements: Small contracts (less than \$50,000.00)-Workers compensation insurance and Automobile Liability Insurance required by law.

The awarded responder shall furnish and keep in full force (at its own cost and expense) the following insurance for the duration of the project and for one year after that:

a. Workers Compensation/Employers Liability Insurance: The Contractor shall take out and maintain during the life of this contract, Employers' Liability and Worker's Compensation Insurance for all of their employees employed at the site of the work, and in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. The City of Huntsville requires a waiver of subrogation against the City. Workers' Compensation limits as required by the Labor Code of the State of Texas and Statutory Employer's Liability Limits.

b. Commercial General Liability at minimum combined single limits of (\$1,000,000 per occurrence and \$2,000,000 general aggregate) for bodily injury, personal injury and for property damages. Policy will include coverage for a) Premises Operations; b) Broad Form Contractual Liability; c) Products and Completed Operations at \$1,000,000 per occurrence; d) Use of Contractors and Subcontractors; e) Personal Injury; f) Broad Form Property Damage; g) Explosion Collapse and Underground (XCU) Coverage (when applicable), Fire Damage, Medical Expense. NOTE: The aggregate loss limit applies to each project.

c. Commercial Automobile Liability at minimum combined single limits of \$300,000 per occurrence for Bodily Injury and Property Damage, including owned, non-owned, and hired vehicle coverage.

d. Professional Liability Insurance shall be \$1,000,000 per occurrence.

e. Builders Risk Insurance for "each" housing unit/structure in the amount of \$100,000 if applicable.

f. Product Liability Insurance will be required when applicable.

All insurance must be written on forms filed with and approved by the Texas Board of Insurance. Certificates of Insurance shall be prepared and executed by the insurance company or its authorized agent.

All insurance must be written on forms filed with and approved by the Texas Board of Insurance. Certificates of Insurance shall be prepared and executed by the insurance company or its authorized agent.

The awarded responder shall furnish at their own expense to the City of Huntsville, a Certificate of Liability Insurance listing the City as an "Additional Insured" via endorsement. In Description of Operations will need wording similar to: Blanket additional insured is added in favor of the certificate holder with respects to the general liability coverage as required by written contract. Blanket Waiver of Subrogation is added in favor of the certificate holder with respects to workers compensations coverage as required by written contract. Certificate Holder to be: City of Huntsville, Attn: Engineering Department, 1212 Ave M, Huntsville, TX 77340.

The required insurance must contain a provision that at least thirty (30) days prior notice of cancellation, non-renewal, or material change of said insurance shall be submitted to the city, by the insurance company. The City reserves the right to full, certified copies of all required insurance policies when requested in writing. Insurance will be required prior to purchase order being issued.

Attachments:
Sample Only Certificate of Liability Insurance



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

①

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER ②	CONTACT NAME:		
	PHONE (A/C, No, Ext):	FAX (A/C, No):	
INSURED ④	E-MAIL ADDRESS:		
	INSURER(S) AFFORDING COVERAGE ③		NAIC #
	INSURER A:		
	INSURER B:		
	INSURER C:		
	INSURER D:		
	INSURER E:		
INSURER F:			

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

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

INSR LTR ⑤	TYPE OF INSURANCE	ADDL SUBR INSR WVD	POLICY NUMBER ⑥	POLICY EFF (MM/DD/YYYY) ⑦	POLICY EXP (MM/DD/YYYY) ⑧	LIMITS ⑨
	GENERAL LIABILITY					EACH OCCURRENCE \$
	COMMERCIAL GENERAL LIABILITY					DAMAGE TO RENTED PREMISES (Ea occurrence) \$
	CLAIMS-MADE ☐ OCCUR ☐					MED EXP (Any one person) \$
						PERSONAL & ADV INJURY \$
						GENERAL AGGREGATE \$
	GEN'L AGGREGATE LIMIT APPLIES PER:					PRODUCTS - COM/OP AGG \$
	POLICY ☐ PRO-JECT ☐ LOC ☐					\$
	AUTOMOBILE LIABILITY ⑩					COMBINED SINGLE LIMIT (Ea accident) \$
	ANY AUTO					BODILY INJURY (Per person) \$
	ALL OWNED AUTOS					BODILY INJURY (Per accident) \$
	SCHEDULED AUTOS					PROPERTY DAMAGE (Per accident) \$
	HIRED AUTOS					\$
	UMBRELLA LIAB					EACH OCCURRENCE \$
	EXCESS LIAB					AGGREGATE \$
	DED ☐ RETENTION \$					\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY					WC STATUTORY LIMITS ⑪ OTH-ER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N ☐	N/A			E.L. EACH ACCIDENT \$
						E.L. DISEASE - EA EMPLOYEE \$
						E.L. DISEASE - POLICY LIMIT \$
	Professional Liability					Per Claim \$
						Aggregate \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CITY PROJECT ID: _____

PROJECT TITLE DESCRIPTION: _____

CERTIFICATE HOLDER

CANCELLATION ⑮

⑭ CITY OF HUNTSVILLE ENGINEERING
City of Huntsville
1212 Ave M
Huntsville, TX 77340

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

⑯

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ACORD 25 (2010/05)

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"SAMPLE ONLY"

Clear All

PROJECT NAME:

PAYMENT APPLICATION

Project No.

PAYMENT APPLICATION NO.

PAGE

1 of

OWNER:

City of Huntsville
1212 Avenue M
Huntsville, Texas 77340

CONTRACTOR:

TIME PERIOD

FROM:

TO:

CONTRACT CHANGE ORDER SUMMARY

ESTIMATE

No.	Approval Date	Amount			
		Additions	Deductions		
		\$ -	\$ -	1. ORIGINAL CONTRACT	\$ 0.00
				2. APPROVED CHANGE ORDERS	\$ 0.00
				3. REVISED CONTRACT (1+2)	\$ 0.00
				4. TOTAL WORK COMPLETED*	\$ 0.00
				5. RETAINAGE * (5%)	\$ 0.00
				6. SUBTOTAL (4 - 5)	\$ 0.00
				7. PREVIOUS PAYMENTS	\$ 0.00
				8. AMOUNT DUE	\$ 0.00
TOTALS		\$ -	\$ -		
NET CHANGE		\$0.00		* DETAILED BREAKDOWN ATTACHED	

CONTRACT TIME

Original(days)		On Schedule ☐ YES ☐ NO	Starting Date	
Revised			Projected Completion	
Remaining				

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that to the best of their knowledge, information and belief the work covered by this payment application has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous payment applications were issued and payments received from the owner, and that current payment shown herein is now due.

ARCHITECT OR ENGINEER'S CERTIFICATION

The undersigned certifies that the work has been carefully inspected and to the best of their knowledge and belief, the quantities shown in this payment application correct and the work has been performed in accordance with the contract documents.

Contractor _____

Architect or Engineer _____

By _____

By _____

Print Name _____

Print Name _____

Date _____

Date _____

APPROVED BY OWNER:

INSPECTED BY:

Owner: City of Huntsville

COH Inspector Name: _____

By _____

By _____

Date _____

Date _____

Project Number:

Project Name:

Date From 00-Jan-00 To 0-Jan-00

ITEM NO.	DESCRIPTION	CONTRACT ITEMS				THIS PERIOD		TOTAL TO DATE		REMAINING QUANTITIES
		QUANTITY	UNIT	UNIT PRICE	AMOUNT	QTY. COMPLETE	AMOUNT	QTY. COMPLETE	AMOUNT	
GENERAL ITEMS										
1					\$0.00		\$0.00		\$0.00	
2					\$0.00		\$0.00		\$0.00	
3					\$0.00		\$0.00		\$0.00	
4					\$0.00		\$0.00		\$0.00	
5					\$0.00		\$0.00		\$0.00	
6					\$0.00		\$0.00		\$0.00	
7					\$0.00		\$0.00		\$0.00	
8					\$0.00		\$0.00		\$0.00	
9					\$0.00		\$0.00		\$0.00	
10					\$0.00		\$0.00		\$0.00	
11					\$0.00		\$0.00		\$0.00	
12					\$0.00		\$0.00		\$0.00	
13					\$0.00		\$0.00		\$0.00	
14					\$0.00		\$0.00		\$0.00	
15					\$0.00		\$0.00		\$0.00	
16					\$0.00		\$0.00		\$0.00	
17					\$0.00		\$0.00		\$0.00	
18					\$0.00		\$0.00		\$0.00	
19					\$0.00		\$0.00		\$0.00	
20					\$0.00		\$0.00		\$0.00	
21					\$0.00		\$0.00		\$0.00	
22					\$0.00		\$0.00		\$0.00	
23					\$0.00		\$0.00		\$0.00	
24					\$0.00		\$0.00		\$0.00	
25					\$0.00		\$0.00		\$0.00	
26					\$0.00		\$0.00		\$0.00	
27					\$0.00		\$0.00		\$0.00	
28					\$0.00		\$0.00		\$0.00	
29					\$0.00		\$0.00		\$0.00	
30					\$0.00		\$0.00		\$0.00	
31					\$0.00		\$0.00		\$0.00	
32					\$0.00		\$0.00		\$0.00	
33					\$0.00		\$0.00		\$0.00	
34					\$0.00		\$0.00		\$0.00	
35					\$0.00		\$0.00		\$0.00	
36					\$0.00		\$0.00		\$0.00	
37					\$0.00		\$0.00		\$0.00	
38					\$0.00		\$0.00		\$0.00	
39					\$0.00		\$0.00		\$0.00	
40					\$0.00		\$0.00		\$0.00	
41					\$0.00		\$0.00		\$0.00	
42					\$0.00		\$0.00		\$0.00	
43					\$0.00		\$0.00		\$0.00	
44					\$0.00		\$0.00		\$0.00	
45					\$0.00		\$0.00		\$0.00	

Project Number:

Project Name:

Date From 00-Jan-00 To 0-Jan-00

ITEM NO.	DESCRIPTION	CONTRACT ITEMS				THIS PERIOD		TOTAL TO DATE		REMAINING QUANTITIES
		QUANTITY	UNIT	UNIT PRICE	AMOUNT	QTY. COMPLETE	AMOUNT	QTY. COMPLETE	AMOUNT	
GENERAL ITEMS										
46					\$0.00		\$0.00		\$0.00	
47					\$0.00		\$0.00		\$0.00	
48					\$0.00		\$0.00		\$0.00	
49					\$0.00		\$0.00		\$0.00	
50					\$0.00		\$0.00		\$0.00	
51					\$0.00		\$0.00		\$0.00	
52					\$0.00		\$0.00		\$0.00	
53					\$0.00		\$0.00		\$0.00	
54					\$0.00		\$0.00		\$0.00	
55					\$0.00		\$0.00		\$0.00	
56					\$0.00		\$0.00		\$0.00	
CONTRACT TOTAL					\$0.00	Total	\$0.00		\$0.00	
						Retainage	\$0.00		\$0.00	
						Total	\$0.00		\$0.00	

PART V

GENERAL CONDITIONS (ASCE)

This page intentionally left blank

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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(703) 684-2882
www.nspe.org

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1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

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

D. *Defective:*

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

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or
- 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to

permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

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

- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - 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. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
 - 1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

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

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

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

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and “Or-Equals”*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or-equal” item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. *“Or-Equal” Items:* If in Engineer’s sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an “or-equal” item, in which case review and approval of the proposed item may, in Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its

use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

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

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

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

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts

any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.

- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

- 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

- 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
- 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

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

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER’S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner’s Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws

and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations

on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of,

and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
 - 1. deny the Claim in whole or in part;
 - 2. approve the Claim; or
 - 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
 - g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in

the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 *Change of Contract Price*

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

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's

review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment:

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 Contractor's Warranty of Title

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

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

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
2. 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.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and

- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

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

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- #### A.
- At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

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

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's repeated disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. 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);

2. 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
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. 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.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other

dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

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

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

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

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

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

PART VI

SPECIAL CONDITIONS

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FOR
SPECIAL CONDITIONS OF AGREEMENT

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SPECIAL CONDITIONS

1. GENERAL:

The provisions of this section of the specifications shall govern in the event of any conflict between them and the "General Conditions of Agreement".

Titles to divisions and paragraphs in these CONTRACT DOCUMENTS are introduced merely for convenience and are not to be taken as a part of the specifications and are, furthermore, not to be taken as a correct or complete segregation of the several units of material and labor. No responsibility, either direct or implied, is assumed by the ENGINEER for omissions or duplications by the CONTRACTOR or his SUBCONTRACTOR, due to real or alleged error in arrangement of matter in these CONTRACT DOCUMENTS.

2. OWNER:

The word "OWNER" in these specifications shall be understood as referring to the City of Huntsville, 1212 Avenue M, Huntsville, Texas 77340.

3. ENGINEER:

The word "ENGINEER" in these Specifications shall be understood as referring to the City ENGINEER, City of Huntsville or such other Engineer, Supervisor or Inspector as may be authorized by said OWNER to act in any particular position.

4. LOCATION AND SCOPE OF WORK:

The location and description of work to be performed on this contract consists of furnishing all materials and equipment and performing all labor required to construct all improvements as shown and specified in the contract documents and plans for the work.

5. WAGE RATES:

The labor classification and minimum wage rates set forth herein have been predetermined by the City Council of the City of Huntsville, Texas in accordance with statutory requirements as being the prevailing classifications and rates that shall govern on all work performed by the CONTRACTOR or any SUBCONTRACTOR on the site of the project covered by these CONTRACT DOCUMENTS. In no event shall less than the following rates of wages be paid. (Attached). Texas Govt. Code Chapter 2258.

6. COMPLETION TIME AND LIQUIDATED DAMAGES:

The time of completion is an essential element of this contract. The time of completion for all work herein specified shall be the number of working or calendar days as specified in the Bid Proposal and Standard Form of Agreement from the date specified in the written "Notice to Proceed."

Should the CONTRACTOR fail to complete the work within the above stated time plus any additional time allowed, there shall be deducted from any monies due or which may thereafter become due in the sum of one thousand dollars (\$ 1,000.00) per (working) day, not as a penalty, but as ascertained and liquidated damages.

7. TRADE NAMES:

Except as specified otherwise, wherever in the specifications an article or class of materials designated by a trade name, or by the name or catalog number of any maker, patentee, manufacturer, or dealer, such designation shall be taken as intending to mean and specify the articles described or another equal thereto in quality, finish, and serviceability for the purpose intended, as may be determined and judged by the ENGINEER in his sole discretion.

8. MATERIALS AND WORKMANSHIP:

No material which has been used by the CONTRACTOR for any temporary purpose whatever is to be incorporated in the permanent structure without consent of the ENGINEER.

If materials or equipment are specified by a trade or 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 performance, and to establish an equal basis for the evaluation of bids. If the words "equivalent", "Proper", or "Equal to" are used, that shall be understood to mean that the thing referred to shall be proper, the equivalent of, or equal to some other thing, in the opinion or judgement of the ENGINEER. Unless otherwise specified, all materials shall be the best of their respective kinds and shall be in all cases fully equal to 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 materials, 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.

9. INSURANCE REQUIREMENTS:

1. The CONTRACTOR will not be issued a "Notice to Proceed" on this contract until he has obtained all the insurance required under this section and such insurance has been approved by the OWNER or its representative.

2. The CONTRACTOR shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the CONTRACTOR'S execution of the WORK, whether such execution be by himself or by any SUBCONTRACTOR or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.
 - a. Claims under workman's compensation, disability benefit and other similar employee benefit acts;
 - b. Claims for damage because of bodily injury, occupational sickness or disease, or death of his employees;
 - c. Claims for damage because of bodily injury, sickness or disease, or death of any other than his employees;
 - d. Claims for damage insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the CONTRACTOR, or (2) by any other person; and
 - e. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.
3. Certificates of Insurance acceptable to the OWNER shall be filed with the OWNER prior to commencement of the WORK. These Certificates shall state the policy types, amounts, class of operations covered, effective dates of expiration and shall contain a provision that coverages afforded under the policies will not be canceled or materially altered except after fifteen (15) days prior WRITTEN NOTICE has been received by the OWNER.
4. The CONTRACTOR shall procure and maintain, at his own expense during the CONTRACT TIME, liability insurance as hereinafter specified;
5. CONTRACTOR'S General Public Liability and Property Damage Insurance including vehicle coverage issued to the CONTRACTOR and protecting him from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the CONTRACT DOCUMENTS, whether such operations be by himself, or by any SUBCONTRACTOR under him, or anyone directly or indirectly employed by the CONTRACTOR or by a SUBCONTRACTOR under him. The awarded responder shall furnish and keep in full force (at its own cost and expense) the following insurance during the term of this Contract:

- a. Workers Compensation/Employers Liability Insurance: The Contractor shall take out and maintain during the life of this contract, Employers' Liability and Worker's Compensation Insurance for all of their employees employed at the site of the work, and in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. The City of Huntsville requires a waiver of subrogation against the City.
- b. Commercial General Liability at minimum combined single limits of (\$1,000,000 per occurrence and \$2,000,000 general aggregate) for bodily injury and for property damages, which coverage shall include products/completed operations at \$1,000,000 per occurrence.
- c. Commercial Automobile Liability at minimum combined single limits of \$1,000,000 per occurrence for Bodily Injury and Property Damage, including owned, non-owned, and hired vehicle coverage.
- d. Professional Liability Insurance shall be \$1,000,000 per occurrence.
- e. Builders Risk Insurance for "each" housing unit/structure in the amount of \$100,000 if applicable.

Product Liability Insurance will be required when applicable.

All insurance must be written on forms filed with and approved by the Texas Board of Insurance. Certificates of Insurance shall be prepared and executed by the insurance company or its authorized agent.

The awarded responder shall furnish at their own expense to the City of Huntsville, a Certificate of Liability Insurance listing the City as an **"Additional Named Insured"** via endorsement.

The required insurance must contain a provision that at least thirty (30) days prior notice of cancellation, non-renewal, or material change of said insurance shall be submitted to the city, by the insurance company. The City reserves the right to full, certified copies of all required insurance policies when requested in writing. Insurance will be required prior to purchase order being issued.

Original of insurance policy must be enclosed in bid packet.

The CONTRACTOR shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the PROJECT to the full insurable value thereof for the benefit of the OWNER, the CONTRACTOR, and SUBCONTRACTOR as their interest may appear. This provision shall in no way release the CONTRACTOR or CONTRACTOR'S surety from obligations under the CONTRACT DOCUMENTS to fully complete the PROJECT.

The CONTRACTOR shall procure and maintain, at his own expense, during the CONTRACT TIME, in accordance with the provisions of the laws of the state in which the work is performed, Workmen's Compensation Insurance

Workers' Compensation Insurance Coverage.

DEFINITIONS:

1. Certificate of coverage ("certificate") A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers= compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.
2. Duration of the project includes the time from the beginning of the work on the project until the CONTRACTOR'S/person's work on the project has been completed and accepted by the governmental entity.
3. Persons providing services on the project ("SUBCONTRACTOR" in section 406.096)-includes all persons or entities performing all or part of the services the CONTRACTOR has undertaken to perform on the project, regardless of whether that person contracted directly with the CONTRACTOR and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Service" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.
4. The CONTRACTOR shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the CONTRACTOR providing services on the project, for the duration of the project.
5. The CONTRACTOR must provide a certificate of coverage to the governmental entity before being awarded the CONTRACT.
6. If the coverage period shown on the CONTRACTOR'S current certificate of coverage ends during the duration of the project, the CONTRACTOR must, before the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

7. The CONTRACTOR shall obtain from each person providing services on a project, and provide to the governmental entity:

- a. a certificate of coverage, before that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
- b. no later than seven days after receipt by the CONTRACTOR, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

The CONTRACTOR shall retain all required certificates of coverage for the duration of the project and for one year after that.

The CONTRACTOR shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the CONTRACTOR knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

The CONTRACTOR shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

8. The CONTRACTOR shall contractually require each person with whom it contracts to provide services on a project, to:

- (1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;
- (2) provide to the CONTRACTOR, before that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;
- 3) provide the CONTRACTOR, before the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
- 4) obtain from each other person with whom it contracts, and provide to the CONTRACTOR;
 - a. a certificate of coverage, prior to the other person beginning work on the project; and

- b. a new certificate of coverage showing extension of coverage, before the end of the coverage period if the coverage period shown on the current certificate of coverage ends during the duration of the project;
- c. retain all required certificates of coverage on file for the duration of the project and for one year after that;
- d. notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
- e. contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificates of coverage to be provided to the person for whom they are providing services.

9. By signing this CONTRACT or providing or causing to be provided a certificate of coverage, the CONTRACTOR is representing to the governmental entity that all employees of the CONTRACTOR who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, which the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the CONTRACTOR to administrative penalties, criminal penalties, civil penalties, or other civil actions.

10. The CONTRACTOR'S failure to comply with any of these provisions is a breach of contract by the CONTRACTOR that entitles the governmental entity to declare the CONTRACT void if the CONTRACTOR does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

28 Texas Administrative Code section 110.110 (1994).

- 1. The CONTRACTOR shall secure, if applicable, "All Risk" type Builder's Risk Insurance for WORK to be performed. Unless specifically authorized by the OWNER, the amount of such insurance shall not be less than the CONTRACT PRICE totaled in the BID. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the CONTRACT TIME, and until the WORK is accepted by the OWNER. The policy shall name as the insured the CONTRACT, the ENGINEER, and the OWNER.

10. WATER FOR CONSTRUCTION:

The OWNER shall furnish all water necessary for the completion of the work. All costs associated with collecting and transporting of water shall be borne by the CONTRACTOR.

11. ELECTRICITY FOR CONSTRUCTION:

The CONTRACTOR is responsible for providing any electrical power for the work.

12. TESTING, INSPECTION AND CONTROL:

1. All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standard.
2. The CONTRACTOR shall provide at his expense the necessary testing and inspection services required by the CONTRACT DOCUMENTS, unless otherwise provided.
3. The OWNER shall provide all other inspection and testing service not required of the CONTRACTOR in the CONTRACT DOCUMENTS.
4. If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing or approval.
5. Neither observations by the ENGINEER nor inspections, tests or approvals by persons other than the CONTRACTOR shall relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.
6. The ENGINEER and his representatives will at all times have access to the work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, material, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection, or testing thereof.
7. If any WORK is covered up contrary to the request of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observation and such cover material replaced at the CONTRACTOR'S expense.
8. If any WORK has been covered up which the ENGINEER has not specifically requested to observe prior to its being covered, or if the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR at the ENGINEER'S request, will uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, tools, and equipment. If it is found that such WORK

is defective, the CONTRACTOR will bear all the expenses of such covering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such WORK is not found to be defective, the CONTRACTOR will 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 an appropriate CHANGE ORDER shall be issued.

13. PERMITS:

The CONTRACTOR shall procure and pay all permits, licenses and approvals for execution of this contract. The OWNER shall issue "NO FEE" permits for all work permitted by it.

14. SUBCONTRACTORS:

1. The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.
2. The CONTRACTOR shall not award WORK to SUBCONTRACTOR(S); in excess of fifty (50%) percent of the CONTRACT PRICE, without prior written approval of the OWNER.
3. The CONTRACTOR shall be fully responsible to the OWNER for the acts and omission of his SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.
4. The CONTRACTOR shall cause appropriate provisions to be inserted in all subcontracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS insofar as applicable to the WORK of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.
5. Nothing contained in this CONTRACT shall create any contractual relation between any SUBCONTRACTOR and the OWNER.

15. USE OF PREMISES AND REMOVAL OF DEBRIS: The contractor expressly undertakes at his own expense:

- a) to take every precaution against injuries to persons or damage to property;
- b) to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will duly interfere with the progress of his work or the work of any other contractors;

- c) to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work;
- d) to clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly, and workmanlike appearance.
- e) before final payment to remove all surplus materials, false work, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operation, and to put the site in a neat, orderly condition;
- f) to effect all cutting, fitting or patching of his work required to make the same to conform to the plans and specifications and, except with the consent of the Owner's Representative, not to cut or otherwise alter the work of any other Contractor.

16. PROTECTION OF TREES, PLANTS AND SHRUBS:

The CONTRACTOR shall protect all trees, plants, shrubs and other landscaping which are not specifically within the limits of new construction as shown on the project plans. Removals of any trees, plants and shrubs within the project limits shall only be at the direction of the ENGINEER or OWNER.

17. TRAFFIC AND ACCESS, WARNING SIGNS, BARRICADES, DETOURS:

a. Traffic and Access

The CONTRACTOR shall provide temporary "No Parking" and all other signs which may be deemed necessary for the safe and orderly conduct of vehicular traffic as directed by the ENGINEER and as specified herein. He shall also provide a barricaded area in the parking lane for pedestrian traffic during such time as the parkway is unfit to be used for pedestrian traffic.

At such times as driveways are inaccessible due to the CONTRACTOR'S work they shall be blocked by two (2) delineators. Driveways that are ramped or planked for temporary access shall be provided with a barricade or delineator at each side. The CONTRACTOR shall give 24-hour notice to affected property owners prior to blocking any driveway.

The CONTRACTOR shall provide access for refuse collection on the regularly scheduled days. He shall also facilitate or assist in the collection where such work is hampered by his operations.

b. Street Closures, Detours, Barricades

The CONTRACTOR shall not close any street within the City of Huntsville without first obtaining the approval of the ENGINEER. Barricading, traffic control and detour diagrams shall be submitted by the CONTRACTOR as required by the ENGINEER.

The CONTRACTOR shall maintain traffic control and shall provide and install barricades, delineators, warning devices and construction signs in accordance with Sections 7.7 and 7.8 of the Texas Highway Department "Standard Specifications for Construction of Highways, Streets and Bridges", latest edition, and in accordance with the Texas Manual on Uniform Traffic Control Devices, latest edition.

The CONTRACTOR shall provide and maintain Class II barricades along excavation edges parallel to the flow of traffic at a spacing of twenty-five feet (25'). Class II barricades mounted with flashers shall be installed around work areas in parkways. Class II barricades shall have alternating black and reflectorized white (or yellow) stripes at an angle of 45 degrees. The stripe width shall be four to six inches (4" - 6").

During paving operations barricades may be supplemented with minimum size eighteen-inch (18") high traffic cones and delineators such that spacing between barricades and/or cones or delineators is no greater than twenty-five feet (25'). At all access points such as intersecting streets, alleys and driveways, barricades and/or cones shall be provided at five-foot (5') intervals so as to prevent vehicular access to the paving area. Where access from an intersecting street is prohibited, a "Road Closed" sign shall be provided at the nearest prior intersection. "No Left Turn" signs shall be provided wherever required by the ENGINEER.

When one-way access from a side street or alley is permitted, barricades and cones shall be provided at five-foot (5') intervals for a distance of fifty feet (50') on either side of the centerline of the intersecting street or alley.

Should the CONTRACTOR fail to furnish a sufficient number of traffic and/or pedestrian safety devices, the City will place such necessary items and the CONTRACTOR shall be liable for the cost to the City for providing such devices.

Judgement as to adequate or sufficient barricading shall be that which is adequate or sufficient in the opinion of the ENGINEER.

The CONTRACTOR shall relocate, preserve and maintain the visibility of all existing signs within the project limits which affect the flow of traffic, as directed by the Engineer. Any signs which are damaged or found to be missing during the course of construction shall be replaced by the CONTRACTOR at his expense as directed by the ENGINEER. All other signs that interfere with the course of work and are not necessary for the safe flow of traffic will be removed and replaced by the City. Traffic control signs include Stop Signs, Speed Limit, Parking Restrictions and other regulatory signs.

Unless otherwise specified in these documents or on the plans, traffic control and safety requirements shall be considered as part of or incidental to all related bid items and the costs therefor are to be included in the prices bid for such related items of work.

18. LINES AND GRADES:

The ENGINEER shall furnish the CONTRACTOR with control hubs for lines and bench marks for elevations for the proper prosecution of the work performed under this contract. The CONTRACTOR shall be held responsible for the proper preservation of all benchmarks and stakes. If, in the opinion of the ENGINEER, any marks or stakes have been destroyed or carelessly disturbed by the CONTRACTOR or his employees, the cost of replacing them may be charged against the CONTRACTOR, to be deducted from any money due him under this contract.

The ENGINEER shall be responsible for the construction staking of the work in accordance with the plans and shall furnish all labor, materials, equipment and services required for the proper staking of the work.

The CONTRACTOR shall install and maintain sufficient batter boards to assure the proper performance of the contract and the construction of all items to the required lines and grades; for this purpose the CONTRACTOR shall maintain capable personnel on the job at all times. If, in the opinion of the ENGINEER, the CONTRACTOR is not maintaining sufficient batter boards and intermediate line and grade stakes for proper prosecution of the work, the ENGINEER shall have the authority to stop the construction until such time as the CONTRACTOR provides these items.

The CONTRACTOR must satisfy himself before commencing work as to the correctness and meaning of all stakes, measurements, and marks. No claim will be entertained on account of alleged inaccuracies unless the CONTRACTOR notifies the ENGINEER in writing in time for the ENGINEER to verify or check such stakes and marks before the work is commenced.

19. GUARANTY AGAINST DEFECTIVE WORK:

The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of one (1) year from the date of SUBSTANTIAL COMPLETION unless otherwise called for on the plans or specifications. The CONTRACTOR warrants and guarantees for a period of one (1) year from the dated of SUBSTANTIAL COMPLETION of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

20. NON-DISCRIMINATION AND EQUAL EMPLOYMENT OPPORTUNITY:

During the performance of this contract, the CONTRACTOR agrees as follows:

(1) The CONTRACTOR will not discriminate against any employee or applicant for employment because of race, religion, sex, color, or national origin. The CONTRACTOR will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, with regard to their race, religion, sex, color, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The CONTRACTOR will, in all solicitations or advertisements for employees placed by or on behalf of the CONTRACTOR, state that all qualified applicants will receive consideration for employment without regard to race, religion, sex, color, or national origin.

21. LANDFILL DUMPING REQUIREMENTS FOR CONSTRUCTION CONTRACTORS

- (1) All material brought to the landfill will be charged a dumping fee.
- (2) Trees, stumps, and large limbs over 4" in diameter must be cut no longer than 4' in length.
- (3) Trees, stumps, and large limbs must be separated from garbage and trash.
- (4) Dirt which is attached to the tree stumps must be removed.
- (5) Concrete and brick must be separated from garbage and trash.

22. PRE-CONSTRUCTION CONFERENCE

Contractor shall attend a pre-construction conference. The Contractor's representative who will be on the job and be responsible for the job shall also attend.

23. ROADWAY REPAIR

Roadway repair shall include cement stabilized backfill and surface course as per City Standards. Roadway repair shall be paid by linear foot regardless of trench width.

24. TCEQ REGULATIONS

The following revisions and regulations are based on the TCEQ Sewage Collection System Submittal Application for Plans and Specifications Review as an aid in fulfilling the review requirements of TCEQ Chapter 217, titled *Design Criteria for Domestic Wastewater Systems*.

In case of a conflict between project plans, specifications or addendums for the following priority shall control:

- 1) Addendums
- 2) Special Conditions
- 3) Project Plans
- 4) Project Specifications

1. Revise section item 140 “Material Specifications for Sanitary Sewer Manholes” and Item 227, “Construction Specifications for Vault and Manhole Construction” as follows:

ADD: Watertight, size on size resilient connectors conforming to ASTM C-923 shall be utilized in connecting pipe to manholes. The use of brick for adjusting manhole frame and covers to grade is prohibited.

Manhole Inverts. The bottom of the manhole shall be provided with a “U” shaped channel that is as much as possible a smooth continuation of the inlet and outlet pipes. For manholes connected to pipes less than 15 inches in diameter the channel depth shall be at least half the largest pipe diameter. For manholes connected to pipes less than 15 to 24 inches in diameter the channel depth shall be at least three fourths the largest pipe diameter. For manholes connected to pipes greater than 24 inches in diameter the channel depth shall be at least equal to the largest pipe diameter. In manholes with pipes of different sizes, the tops of the pipes shall be placed at the same elevation and flow channels in the invert sloped at a minimum of 0.5 inch per foot. Where sewer lines enter the manhole higher than 24 inches above the manhole invert, the invert shall be filleted to prevent solids deposition. A drop pipe should be provided for a sewer entering a manhole more than 24 inches above the invert.

ADD: 6" Cement stabilized sand required under all prefabricated manholes with bottoms.

2. Revise item 101 “Material Specifications for Backfill” and item 201 “Construction Specifications for Excavation and Backfill” as follows:

ADD: All bedding of pipe shall comply with ASTM D-2321, Class 1B, for materials and densification. A minimum of 4" of bedding is required for all pipe. All trenches within three (3') feet of an existing roadway surface or paved surface shall be backfilled with three sack/cy cement stabilized sand backfill.

Bedding Trenching and Backfill: the width of the trench shall be minimized, but shall be ample to allow the pipe to be laid and jointed properly and allow the backfill to be placed and compacted as needed. The trench width shall be a minimum of 12 inches greater than the outside diameter of the pipe and a maximum of 24 inches greater than the outside diameter of the pipe. Pipes larger than 24 inch diameter may have greater maximum trench widths upon approval of the ENGINEER. All trench widths shall be strictly adhered to for a depth from pipe flow line to one (1') foot above the pipe.

Unauthorized Trench Widths: Where, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted, either pipe of adequate design, total concrete pipe encasement, or arch concrete encasement as required by loading conditions and as determined by the ENGINEER shall be furnished and installed by and at the expense of the CONTRACTOR. The determination of necessary pipe, special embedment, or arch concrete encasement shall be based on a pipe strength equal to the minimum three-edge bearing ultimate strength stipulated in the governing pipe specifications for the size and kind of pipe involved with a safety factor of 6.5. Trench loading will be based on saturated backfill weighing 120 pounds per cubic foot with suitable allowance for truck or other live load where required.

If faults, caverns or subsidence are discovered during construction, the CONTRACTOR shall immediately halt construction and notify the ENGINEER. No construction shall proceed until the ENGINEER has evaluated and notified the CONTRACTOR in writing of any changes which may be required.

3. **Revise** specification item 110 “Material Specifications for Sewer Pipe”, as follows:

ADD: Unless otherwise noted, all gravity sewer pipe shall be PVC-SDR 35 with a tensile strength of 7000 psi and a cell classification of 12454-B

4. **Revise** specification item 210.7 “Testing of Gravity Sewer Pipe”, as follows:

ADD:

- 1) Infiltration or Exfiltration Tests. The total exfiltration as determined by a hydrostatic head test shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole. When pipes are installed below the groundwater level an infiltration test shall be used in lieu of the exfiltration test. The total infiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing groundwater level, whichever is greater. For construction within 25-year flood plain, the infiltration or exfiltration shall not exceed ten gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, remedial action shall be undertaken in order to reduce the infiltration or exfiltration to an amount within the limits specified.

2) Low Pressure Air Test. The procedure for the low pressure air test shall conform to the procedures described in ASTM C-828, ASTM C-924, ASTM F-1417 or other appropriate procedures, except for testing times. The test times shall be as outlined in this section. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply unless the pipe is to be joint tested. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = (0.085 \times D \times K)/Q$$

T = time for pressure to drop 1.0 pound per square inch gauge in seconds

K = $0.000419 \times D \times L$, but not less than 1.0

D = average inside pipe diameter in inches

L = length of line of same pipe size being tested, in feet

Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used

Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

Pipe Diameter (Inches)	Minimum Time (Seconds)	Length for Minimum Time (Feet)	Time of Longer Length (Seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693(L)
21	1190	114	10.471(L)
24	1360	100	13.676(L)
27	1530	88	17.309(L)
30	1700	80	21.369(L)
33	1870	72	25.856(L)

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined in this subparagraph or until failure. Lines with a 27-inch average inside diameter and larger may be air tested at each joint. Pipe greater than 36-inch diameter must be tested for leakage at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be ten seconds.

3) Deflection Testing. Deflection tests shall be performed on all flexible pipes. For pipelines with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection. For pipelines with an inside diameter 27 inches and greater, a method approved by the ENGINEER shall be used to test for vertical deflections. Other methods shall provide a precision of two tenths of one percent (0.2%) deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5.0%. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices.

- a. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) Equal to 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thickness for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, all dimensions shall be per appropriate standard. Statistical or other “tolerance packages” shall not be considered in mandrel sizing.
- b. Mandrel Design. The rigid mandrel shall be constructed of a metal or rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more “runners” or “legs” as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.
- c. Method Options. Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. A deflectometer may be approved for use on a case-by-case basis. Mandrels with removable legs or runners may be accepted on a case-by-case basis.

4) Testing: Manholes shall be tested for leakage separately and independently of the wastewater lines by hydrostatic exfiltration testing, vacuum testing, or other methods acceptable to the ENGINEER. If a manhole fails a leakage test, the manhole must be made water tight and retested. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour. Alternative test methods must ensure compliance with the above allowable leakage. Hydrostatic exfiltration testing shall be performed as follows: all wastewater lines coming into the manhole shall be sealed with an internal pipe plug, then the manhole shall be filled with water and maintained full for at least one hour. For concrete manholes a wetting period of 24 hours may be used prior to testing in order to allow saturation of the concrete.

5) **Revise** Item 207.1 “Construction Specifications – General”, as follows:

ADD Separation Distances: The following rules apply to separation distances between potable water and wastewater treatment plants, and waterlines and sanitary sewers.

6) Waterline/new sewer line separation. When new sanitary sewers are installed, they shall be installed no closer to waterlines than nine feet in all directions. Sewers that parallel waterlines must be installed in separate trenches. Where the nine-foot separation distance cannot be achieved, the following guidelines will apply.

- a. Where a sanitary sewer parallels a waterline, the sewer shall be constructed of cast iron, ductile iron, or PVC meeting ASTM specifications with a pressure rating for both the pipe and joints of 150 psi. The vertical separation shall be a minimum of two feet between outside diameters and the horizontal separation shall be a minimum of four feet between outside diameters. The sewer shall be located below the waterline
- b. Where a sanitary sewer crosses a waterline, the sewer shall be constructed of cast iron, ductile iron, or PVC with a minimum pressure rating of 150 psi, an absolute minimum of 6 inches between outside diameters shall be maintained. In addition, the sewer shall be located below the waterline where possible and one length of the sewer pipe must be centered on the waterline.
- c. Where a sewer crosses under a waterline and the sewer is constructed of ABS truss pipe, similar semi-ridged plastic composite pipe, clay pipe, or concrete pipe with gasket joints, a stabilized sand (two or more bags of cement per cubic yard of sand) for all sections of sewer within nine feet of the waterline. This initial backfill shall be from one quarter diameter below the centerline of the pipe to one pipe diameter (but not less than 12 inches) above top of the pipe.

- d. Where a sewer crosses over a waterline, all portions of the sewer within nine feet of the waterline shall be constructed of cast iron, ductile iron, or PVC pipe with a pressure rating of at least 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at five feet intervals with spacers or be filled to the springline with washed sand. The encasement pipe should be centered on the crossing and both ends sealed with cement grout or manufactured seal.
- 7) Waterline/manhole separation. Unless sanitary sewer manholes and the connecting sewer can be made watertight and tested for no leakage, they must be installed so as to provide a minimum of nine feet of horizontal clearance from an existing or proposed waterline. Where the nine-foot separation distance cannot be achieved, a carrier pipe as described in the paragraph above may be used where appropriate.

25. TEMPORARY SEDIMENT CONTROL FENCE:

1. DESCRIPTION. This item shall govern for the materials to be furnished and for the installation, maintenance and removal of temporary sediment control fence placed in locations as directed by the ENGINEER. This item will be used temporarily during construction to control erosion and sedimentation.
2. MATERIALS.
 1. Fence Description. The fence shall be a net-reinforced fence, using woven geotextile fabric.
 2. Fabric. Fabric materials shall meet the requirements of Departmental Materials Specification D-9-6230, "Temporary Sediment Control Fence Fabric."
 3. Posts. Posts shall be a minimum of 48" long, essentially straight, and shall be wood or steel, unless otherwise shown on the plans. Softwood posts shall be at least 3" in diameter or nominal 2" X 4". Hardwood posts shall have a minimum cross-section of 1.5" X 1.5". Steel posts shall be "T" or "L" shaped with a minimum weight of 1.3 pounds per linear foot.
 4. Net Reinforcement. Net reinforcement shall be galvanized welded wire of a minimum 12.5-gauge wire or equal as approved by the ENGINEER with a maximum opening size of 2" X 4" and shall be at least 24" wide unless otherwise shown on the plans.

5. Staples. Staples used to secure reinforcement and fabric to wood posts shall have a crown at least 3/4" wide and legs 1/2" long.
 6. Used Materials. Previously-used materials from other projects, meeting the above requirements and when approved by the ENGINEER, may be used. Previously used materials from within the project shall be used whenever possible.
3. CONSTRUCTION METHODS. The temporary sediment control fence shall be used during construction near the downstream perimeter of a disturbed area to intercept sediment from shear flow. The fence may be incorporated into the erosion control measures used to control sediment in areas of higher flow. The fence installation methods shall be as specified below unless otherwise shown on the plans. The physical alignment and location of the fence shall be as shown on the plans or as directed by the ENGINEER.
- a) Installation of Posts. Posts shall be embedded to 18" deep, or adequately anchored if in rock, with a spacing of 6' to 8', and installed on a slight angle toward the anticipated run-off source.
 - b) Fabric Anchoring. Trenches shall be dug along the uphill side of the fence to anchor 6" to 8" of fabric. The trench shall have a minimum cross section of 6" X 6". The fabric is against the side of the trench and approximately 2" of fabric is across the bottom in the upstream direction. The trench shall then be backfilled and hand tamped as approved by the ENGINEER.
 - c) Fabric Attachment. The reinforcement shall be attached to the end posts, if wood, by staples, or if steel, by T-clips or sewn vertical pockets at a minimum of four (4) locations. The reinforcement shall be attached to each succeeding post as approved by the ENGINEER. The ends of successive reinforcement sheets or rolls shall be connected at a fence post at least six (6) times with hog rings.
 - d) The fabric shall be fastened to the top strand of reinforcement by hog rings or cord at a maximum spacing of 15".
 - e) Fabric Splices. Splices shall occur at a fence post and shall have a lap of 6" attached in at least six (6) places. Splices in concentrated flow areas will not be permitted.

When removing temporary sediment control fence that is suitable for relocation, the CONTRACTOR shall take all necessary measures to maintain the fabric in the best condition.

Requirements for installation of used temporary sediment control fence shall include:

1. Minimal or no visible signs of biodegradation (weak fibers)
2. No excessive patching every 15' to 20'
3. Posts must not be bent and backing must not have holes.
4. Maintenance. The temporary sediment control fence shall be maintained in good condition (including staking, tension anchoring, tension adjustments, etc.) by the Contractor. All necessary work and materials to maintain the integrity of the fence, including keeping fabric free of accumulated silt, debris, etc., shall be provided until earthwork construction and permanent erosion control features are in place, and/or the disturbed area has been adequately stabilized. When the Item, "Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control", is in the contract, stabilization shall be as described in that specification. The areas damaged by the removal process shall be stabilized by the CONTRACTOR using appropriate methods as approved by the ENGINEER.

Torn or punctured fabric shall be repaired by the placement of a patch consisting of an additional layer of fabric over the damaged area. The patch shall have a minimum overlap of 1.5' in all directions and be securely attached to the repaired fabric.

When the accumulated sediment deposit reaches a depth of approximately 0.50 feet it shall be removed and disposed of at approved sites in a manner that will not contribute to additional siltation. If the structure ceases to function as intended, the ENGINEER may direct that the fence or portions thereof be replaced. Such replacement will be measured for payment.

5. Measurement. Temporary sediment control fence will be measured by the foot (meter) of fence, complete in place, measurement being made along the centerline of the top of the fence.
6. 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 "Temporary Sediment Control Fence." This price shall be full compensation for furnishing, placing and maintenance of the fence (except as shown below); for all required trenching, fence posts, fabric and backfill; and for all labor, tools, equipment and incidentals necessary to complete the work.

26. INDEMNIFICATION

The CONTRACTOR agrees to and shall indemnify and hold harmless the OWNER, its officers, agents and employees from and against any and all claims, losses damages, causes of action, suits and liability of every kind, including all expenses of litigation, court costs, attorney's fees, for injury to or death of any person, or for damage to any property, or for breach of contract, arising out of or in connection with the work done by the CONTRACTOR under this agreement.

The CONTRACTOR shall indemnify and hold OWNER harmless from any claims of material suppliers, mechanics, laborers, or other subcontractors.

The CONTRACTOR shall indemnify and hold OWNER harmless from any and all injuries to or claims of adjacent property owners caused by the CONTRACTOR, its agents, employees, and representatives.

27. SOLID WASTE DISPOSAL:

Contractor shall be responsible for determining with Fire Chief all allowable burning and under what circumstances and conditions said burning will be allowed (if any).

28. PAYMENT RETAINAGE:

For partial payments, a retainage amount of five (5) percent will be held until final payment is made to the contractor.

29. ADA COMPLIANCE AND CONTRACTOR RESPONSIBILITIES:

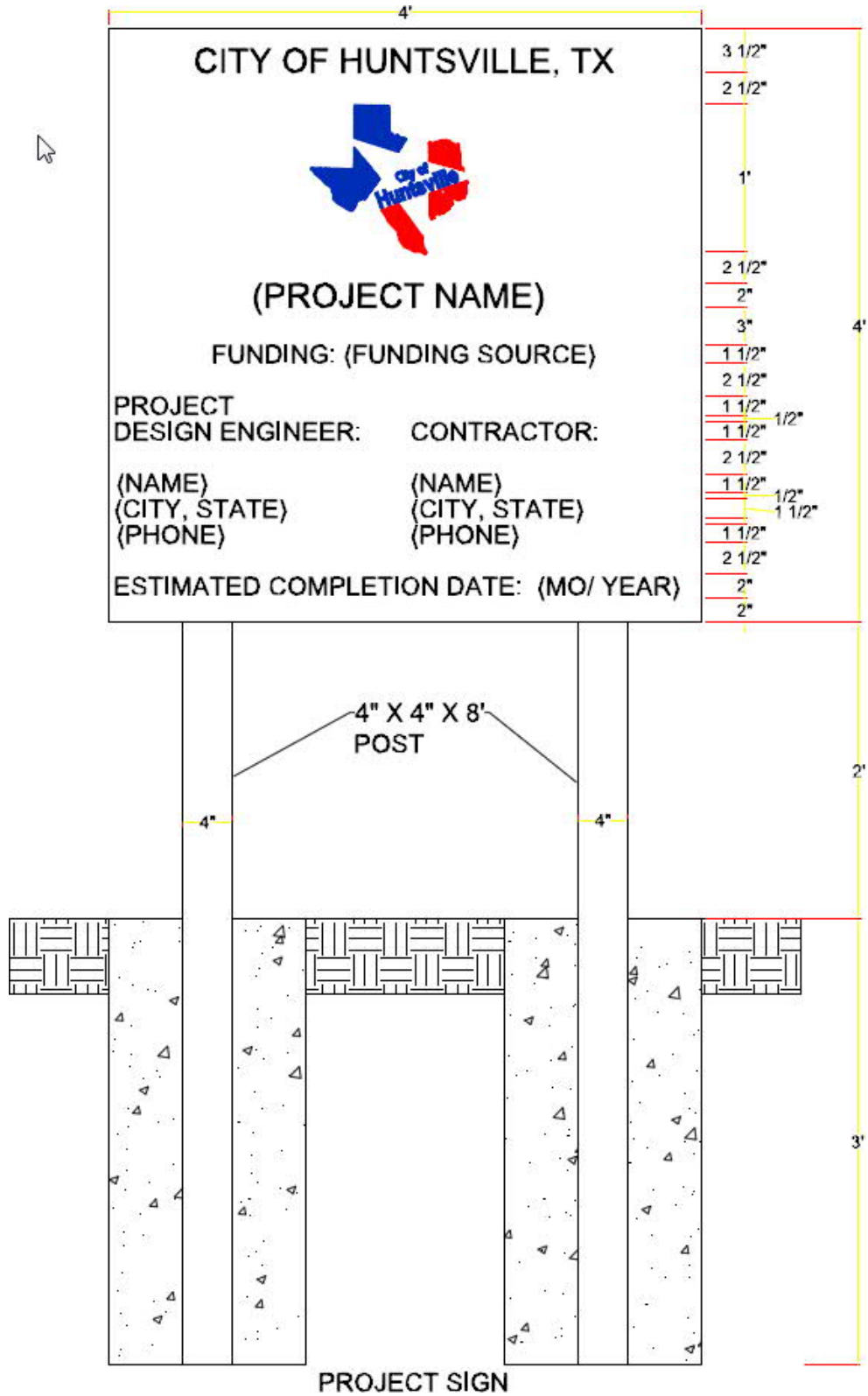
Contractor is responsible for all ADA/TDLR Compliance and regulations in construction of project per the approved plan review set and final inspection performed at Owners Expense. Five 5% retainage will be held until inspection approval has been obtained.

30. PROJECT INFORMATION SIGN

1. At the explicit direction and stated requirement of the City Engineer this/these item(s) shall include the construction, painting, erection, maintenance and removal of project signs for the number of signs indicated in the construction documents at the locations specified therein. Upon completion of the project, the signs shall become the property of the Contractor.
2. The sign shall be constructed from 3/4 inch exterior grade plywood with one smooth side or City Engineer approved equivalent. Paint for the sign shall be a commercial grade exterior paint that will not show signs of fading during the complete construction period. If the sign fades before completion of the project, the Contractor shall repaint the sign to its original quality. Painting of the sign shall be of professional quality equivalent to commercial sign painting. Mounting posts shall be either redwood or pressure treated pine.

3. Mounting posts shall be buried to the depth indicated on the drawing and hand compacted to 6 inch lifts. The sign shall be attached to the mounting posts with 3 bolts per post. Bolts shall be standard grade, minimum 3/8 inch diameter with flat washers on both sides, lock washer and double nuts. Bolts shall be spaced on the sign face between lettering so as not to obscure the wording on the sign and shall be as evenly spaced as possible.
4. The project sign(s) shall be in place within 14 calendar days from the date the Owner awards the contract and shall remain in place during the entire construction period. The project sign(s) shall be removed within 14 calendar days after the Owner's acceptance of the project improvements.
5. Required Content on Project Information Signs:
 - City name and logo
 - Project name
 - Funding source
 - Project design engineer's name(s), location, phone number
 - General contractor's name(s), location, phone number
 - Optional information: name and/or address of owner, developer, architect, engineer or other contractors on site
6. The signs CANNOT be located within the clear vision or (sight triangle) as depicted in table 10-2 of the City of Huntsville Development Code.
7. Furnish, placement, and relocating of project signs shall be performed with no separate pay.

SEE PROJECT SIGN EXAMPLE BELOW



31. Modifications to the STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Section 4.03.C.3 is amended as follows:

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefore as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

Section 5.03.B is amended as follows:

B. Owner may deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

Section 5.04.B is amended as follows:

Delete from the first sentence of Paragraph 5.04.B.1, the phrase "(subject to any customary exclusion regarding professional liability)."

Revise the last phrase in Paragraph 5.04.B.1 to read "and the insurance afforded to these additional insureds shall provide primary and noncontributory coverage for all claims covered thereby;"

Add the following language at the end of Paragraph 5.04.B.1:

Policies of insurance shall also include Strand Associates, Inc.® as additional insureds under the provisions of Paragraphs 5.04.A.3 through 5.04.A.6.

Add the following new paragraphs immediately after Paragraph 5.04.B:

C. Additional Insured Endorsements

1. CONTRACTOR shall purchase and maintain liability insurance, as described above, specifically naming as additional insureds OWNER and ENGINEER as well as other individuals or entities so identified (see the Supplementary Conditions), using Additional Insurance Endorsement Form CG 20 26 07 04, CG 20 10 07 04, or equivalent form. General liability policies shall also be endorsed with Form CG 20 37 07 04 to include the "products-completed operations coverage."

D. Endorsements or General Liability policy shall not exclude supervisory or inspection services.

CONTRACTOR shall also provide an Additional Insured Endorsement for the automobile policy. Endorsement shall be CA 20 48, or equal.

Section 5.06.A is amended as follows:

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

Section 5.06.B is amended as follows:

B. Owner may purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

Section 6.20 is amended as follows:

Add the following to the end of Paragraph 6.20.A:

In addition, CONTRACTOR shall indemnify, hold harmless, and pay for the defense of OWNER and ENGINEER from and against claims, losses, or damages in regard to any act or failure to act by OWNER or ENGINEER in connection with general supervision, inspection, and/or coordination of CONTRACTOR 's operations.

CONTRACTOR shall, at its own expense, appear, defend, and pay all fees of attorneys and all costs and other expenses arising therefrom or incurred in connection therewith; and, if any judgments shall be rendered against any individual or entity indemnified hereunder in any such action, CONTRACTOR shall, at its own expense, satisfy and discharge same. CONTRACTOR expressly understands and agrees that any Letter of Credit or insurance protection required by the Contract, or otherwise provided by CONTRACTOR, shall in no way limit the responsibility to indemnify, keep and save harmless, and defend any individual or entity indemnified hereunder as herein provided.

Delete Paragraph 6.20.C.I and 6.20.C.2. Insert new Paragraphs 6.20.C.J and D:

1. the preparation of Drawings, Specifications, or Property Surveys.

D. For any matter for which OWNER and ENGINEER are indemnified under Paragraph 6.20.A, CONTRACTOR shall pay for OWNER's and ENGINEER's reasonable defense, including, but not limited to, all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs or awards until OWNER or ENGINEER are found negligent. If OWNER or ENGINEER are found negligent, OWNER or ENGINEER shall reimburse CONTRACTOR for the prorated extent of OWNER's or ENGINEER's negligence for the cost of OWNER's or ENGINEER's reasonable defense.

E. In Paragraphs 6.20.A through D. as may be amended by the Supplementary Conditions, ENGINEER shall also include Strand Associates, Inc.[®]

Section 8.13 is amended as follows:

Add the following new paragraph immediately after Paragraph 8.12.A:

A. OWNER will assume the duties and responsibilities of the Resident Project Representative as defined in Article 9.03.

Section 9.03 is amended as follows:

Add the following new paragraph immediately after Paragraph 9.03.A:

B. Strand Associates, Inc.[®] provided design services for the Project and will assume all duties and responsibilities of ENGINEER in Article 9 with the exception of Paragraph 9.03.

Section 12.03.B is amended as follows:

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; however no consequential damages, compensatory damages, loss profits or anticipated or future lost profits, special damages or other economic loss shall be awarded.

Section 14.02.B.1 is amended as follows:

1. Engineer will, within 20 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

Section 15.03.A.2 is amended as follows:

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

Section 15.03A by deleting A.3 in its entirety:

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

Sections 16.01.C.1 and .2 are amended as follows:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, however this election does not include arbitration in any form or fashion, whether or not in the Supplementary Conditions, or
2. agrees with the other party to submit the Claim to another dispute resolution process, excluding arbitration, or

Section 17.05.A is amended as follows:

- A. This Contract is to be governed by the law of the state of Texas in which the Project is located and venue shall be in Walker County, Texas.

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PART VII

Federal Labor Standards Provisions & Davis Bacon Wage Rates

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Federal Labor Standards Provisions

U.S. Department of Housing and Urban Development Office of Labor Relations

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who

is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be

awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

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Superseded General Decision Number: TX20210091

State: Texas

Construction Type: Heavy

Counties: Anderson, Falls, Freestone, Grimes, Houston, Jasper, Lee, Leon, Limestone, Madison, Milam, Newton, Polk, Sabine, San Augustine, Shelby, Trinity, Tyler, Walker and Washington Counties in Texas.

HEAVY CONSTRUCTION PROJECTS

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

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$15.00 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 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

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

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022

* SUTX2009-122 04/21/2009

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 13.00 **	0.00
LABORER: Common or General.....	\$ 8.75 **	0.00
LABORER: Pipelayer.....	\$ 11.25 **	0.00
OPERATOR: Backhoe/Trackhoe.....	\$ 15.89	0.00
OPERATOR: Bulldozer.....	\$ 14.25 **	0.00
OPERATOR: Loader (Front End)....	\$ 11.52 **	0.00
TRUCK DRIVER.....	\$ 11.75 **	0.00

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical

order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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

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

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

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

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

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END OF GENERAL DECISION"

PART VIII

**MATERIAL AND CONSTRUCTION
SPECIFICATIONS**

~NOT USED~

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PART IX

Federal Register- Trench Safety

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If it is necessary to stand at the outboard or inboard edge of the deckload where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deckload.

(d) *First-aid and lifesaving equipment.*

(1) Provisions for rendering first aid and medical assistance shall be in accordance with subpart D of this part.

(2) The employer shall ensure that there is in the vicinity of each barge in use at least one U.S. Coast Guard-approved 30-inch lifering with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

(3) Employees walking or working on the unguarded decks of barges shall be protected with U.S. Coast Guard-approved work vests or buoyant vests.

(e) *Commercial diving operations.* Commercial diving operations shall be subject to subpart T of part 1910, §§ 1910.401-1910.441, of this chapter.

[39 FR 22801, June 24, 1974, as amended at 42 FR 37674, July 22, 1977]

§ 1926.606 Definitions applicable to this subpart.

(a) *Apron*—The area along the water-front edge of the pier or wharf.

(b) *Bulwark*—The side of a ship above the upper deck.

(c) *Coaming*—The raised frame, as around a hatchway in the deck, to keep out water.

(d) *Jacob's ladder*—A marine ladder of rope or chain with wooden or metal rungs.

(e) *Rail*, for the purpose of § 1926.605, means a light structure serving as a guard at the outer edge of a ship's deck.

Subpart P—Excavations

AUTHORITY: Sec. 107, Contract Worker Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR

25059), or 9-83 (48 FR 35736), as applicable, and 29 CFR part 1911.

SOURCE: 54 FR 45959, Oct. 31, 1989, unless otherwise noted.

§ 1926.650 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) *Definitions applicable to this subpart.*

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or *sides* means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in

accordance with § 1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less

(measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See “Shield.”

Trench shield. See “Shield.”

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called “sheeting.”

Wales means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

§ 1926.651 Specific excavation requirements.

(a) *Surface encumbrances.* All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) *Underground installations.* (1) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

(2) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

(3) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(4) While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

(c) *Access and egress*—(1) *Structural ramps.* (i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) *Means of egress from trench excavations.* A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) *Exposure to vehicular traffic.* Employees exposed to public 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.

(e) *Exposure to falling loads.* No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with § 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.

(f) *Warning system for mobile equipment.* When mobile equipment is operated adjacent to an excavation, 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 excavation.

(g) *Hazardous atmospheres—(1) Testing and controls.* In addition to the requirements set forth in subparts D and E of this part (29 CFR 1926.50–1926.107) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with subparts D and E of this part respectively.

(iii) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(2) *Emergency rescue equipment.* (1) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous at-

mospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

(h) *Protection from hazards associated with water accumulation.* (1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(2) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(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 require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) *Stability of adjacent structures.* (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) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably

expected to pose a hazard to employees shall not be permitted except when:

(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(ii) The excavation is in stable rock; or

(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(3) Sidewalks, pavements, and appurtenant structure 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.

(j) *Protection of employees from loose rock or soil.* (1) Adequate protection shall be provided to protect employees from 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 face to stop and contain falling material; or other means that provide equivalent protection.

(2) 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 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(k) *Inspections.* (1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout

the shift. 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) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(1) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with §1926.502(b) shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

[54 FR 45959, Oct. 31, 1989, as amended by 59 FR 40730, Aug. 9, 1994]

§ 1926.652 Requirements for protective systems.

(a) *Protection of employees in excavations.* (1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

(b) *Design of sloping and benching systems.* The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3), or, in the alternative, paragraph (b)(4), as follows:

(1) *Option (1)—Allowable configurations and slopes.* (i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical

(34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this subpart.

(2) *Option (2)—Determination of slopes and configurations using Appendices A and B.* Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and shall include all of the following:

(A) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

(B) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include at least the following:

(A) The magnitude of the slopes that were determined to be safe for the particular project;

(B) The configurations that were determined to be safe for the particular project; and

(C) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) *Design of support systems, shield systems, and other protective systems.* Designs of support systems shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(1); or, in the alternative, paragraph (c)(2); or, in the alternative, paragraph (c)(3); or, in the alternative, paragraph (c)(4) as follows:

(1) *Option (1)—Designs using appendices A, C and D.* Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C to this subpart. Designs for aluminum hydraulic shoring shall be in accordance with paragraph (c)(2) of this section, but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with appendix D.

(2) *Option (2)—Designs Using Manufacturer's Tabulated Data.* (i) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

(ii) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

(iii) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall

be made available to the Secretary upon request.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and include all of the following:

(A) Identification of the parameters that affect the selection of a protective system drawn from such data;

(B) Identification of the limits of use of the data;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include the following:

(A) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

(B) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Secretary upon request.

(d) *Materials and equipment.* (1) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.

(2) Manufactured materials and equipment used for protective systems shall be used and maintained in a man-

ner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

(e) *Installation and removal of support—(1) General.* (i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(ii) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(iv) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(vi) Backfilling shall progress together with the removal of support systems from excavations.

(2) *Additional requirements for support systems for trench excavations.* (i) Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and

there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) *Sloping and benching systems.* Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) *Shield systems*—(1) *General.* (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

APPENDIX A TO SUBPART P OF PART 1926—SOIL CLASSIFICATION

(a) *Scope and application*—(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in §1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C

to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in §1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions.* The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- (i) The soil is fissured; or
- (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (iii) The soil has been previously disturbed; or
- (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.
- (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (v) Dry rock that is not stable; or
- (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means:

- (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- (ii) Granular soils including gravel, sand, and loamy sand; or
- (iii) Submerged soil or soil from which water is freely seeping; or
- (iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*—(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) *Basis of classification.* The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) *Reclassification.* If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests*—(1) *Visual tests.* Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained

material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(2) *Manual tests.* Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) *Dry strength.* If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard

designation D2488—"Standard Recommended Practice for Description of Soils (Visual—Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(iv) *Other strength tests.* Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as a unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

APPENDIX B TO SUBPART P OF PART 1926—SLOPING AND BENCHING

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in §1926.652(b)(2).

(b) *Definitions.*

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely

to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements*—(1) *Soil classification*. Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(2) *Maximum allowable slope*. The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) *Actual slope*. (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least $\frac{1}{2}$ horizontal to one vertical ($\frac{1}{2}$ H:1V) less steep than the maximum allowable slope.

(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with §1926.651(i).

(4) *Configurations*. Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1
MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) ^[1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP. ^[3]
STABLE ROCK TYPE A ^[2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½ : 1 (34°)

NOTES:

- Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
- A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).
- Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

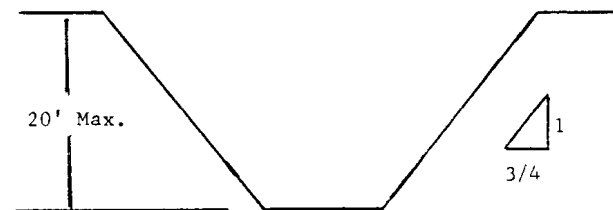
Figure B-1

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

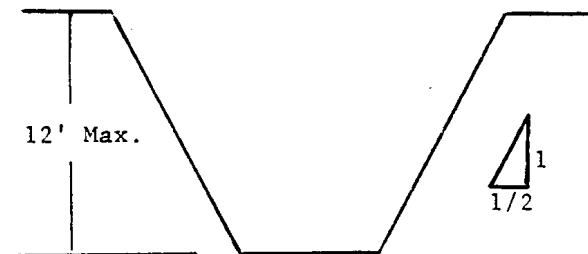
B-1.1 Excavations made in *Type A* soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$:1.



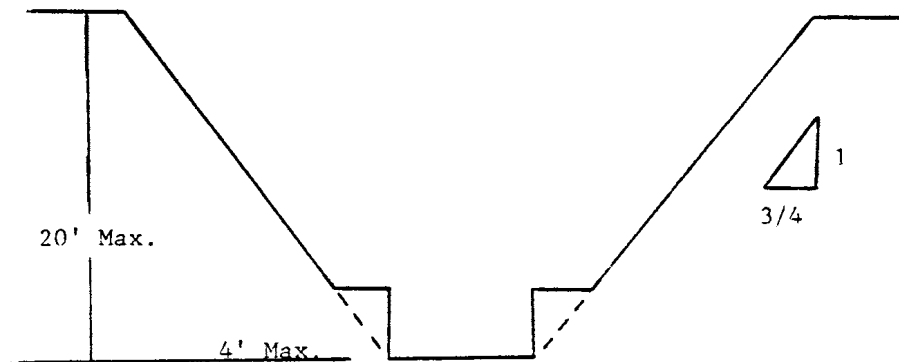
SIMPLE SLOPE—GENERAL

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of $\frac{1}{2}$:1.

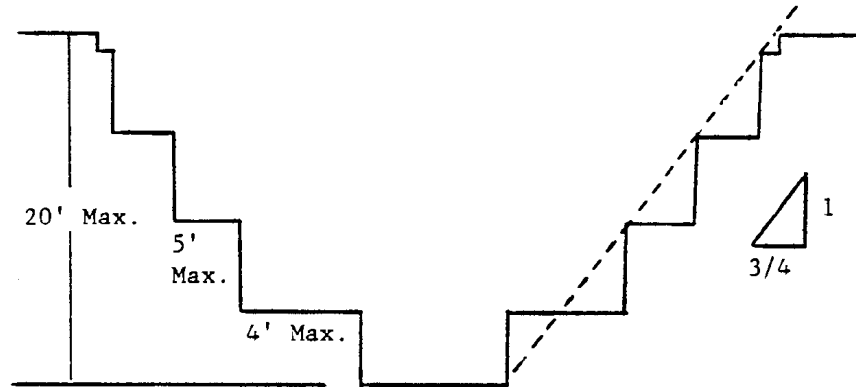


SIMPLE SLOPE—SHORT TERM

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as follows:

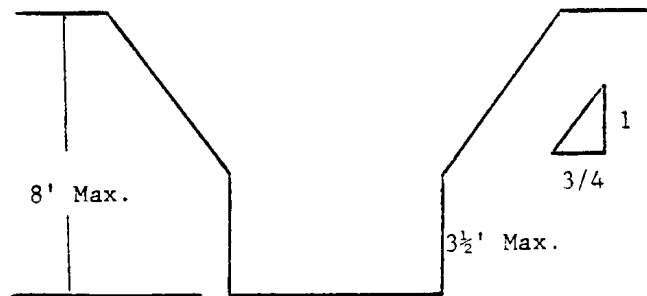


SIMPLE BENCH



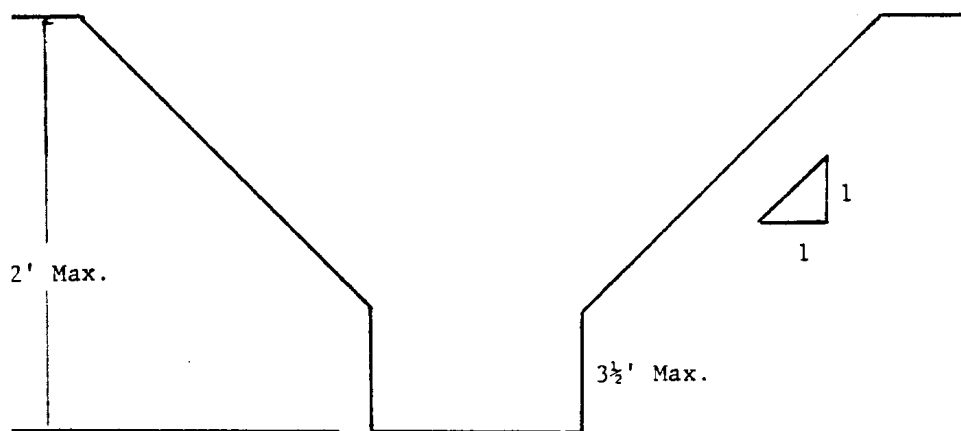
MULTIPLE BENCH

3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.



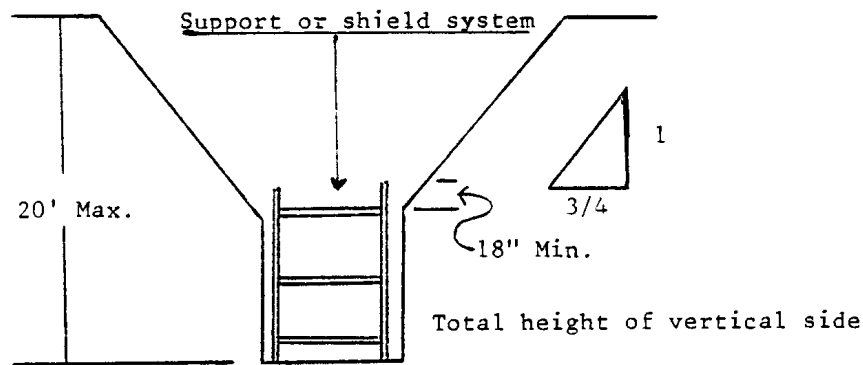
UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 8 FEET IN DEPTH

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.



UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 12 FEET IN DEPTH

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of $\frac{3}{4}$:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

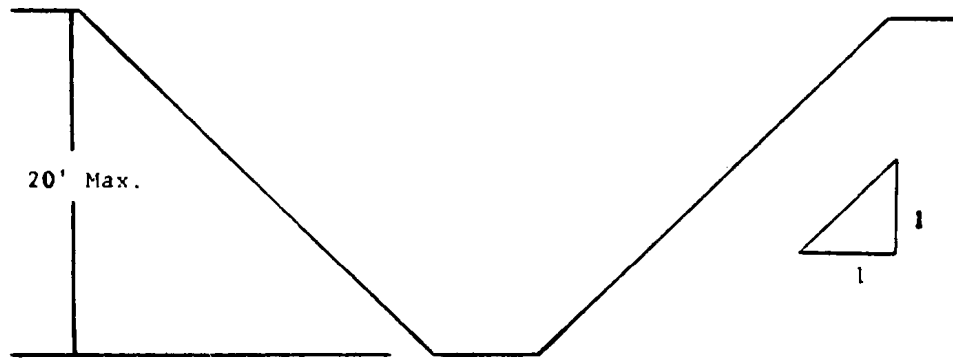


SUPPORTED OR SHIELDED VERTICALLY SIDED LOWER PORTION

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

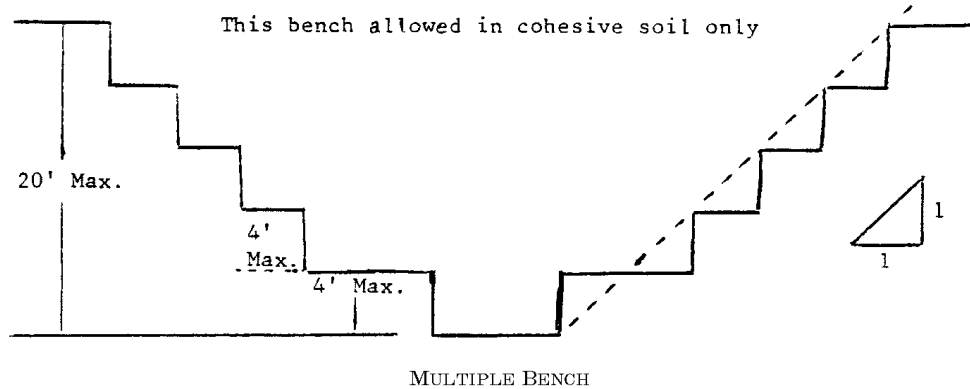
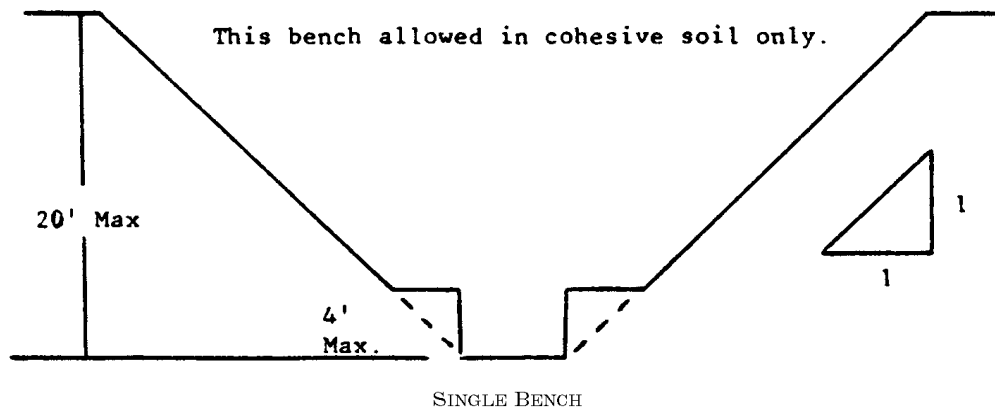
B-1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

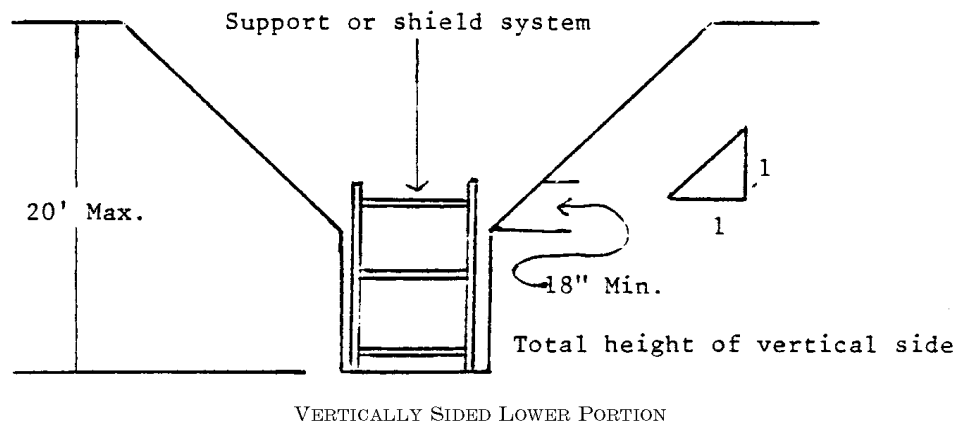


SIMPLE SLOPE

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:



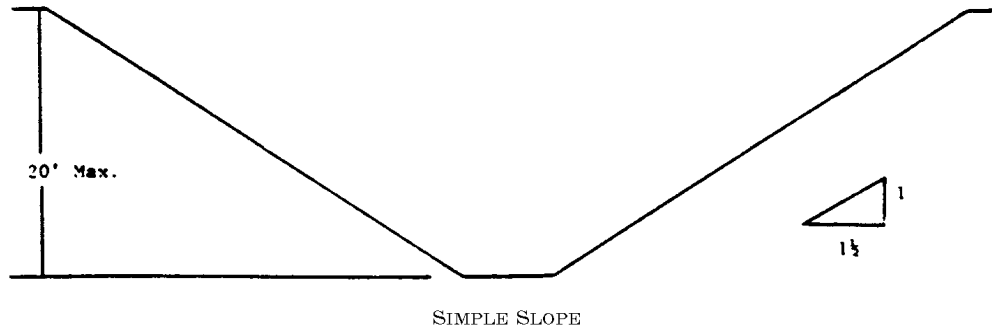
3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.



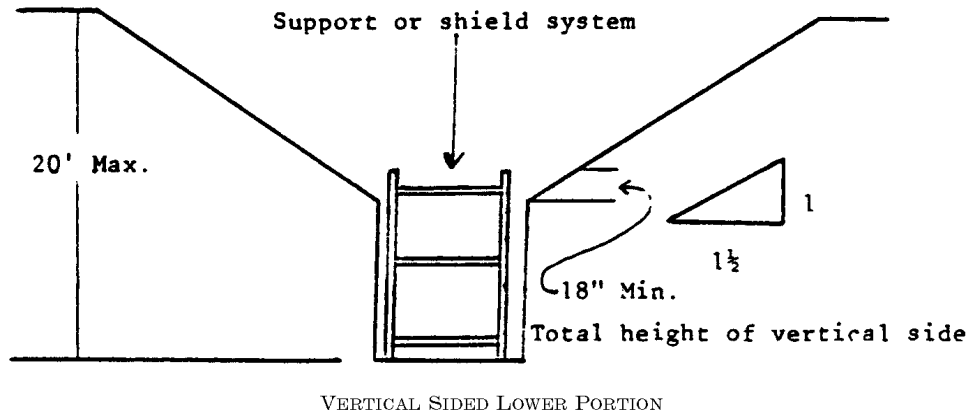
4. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

B-1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



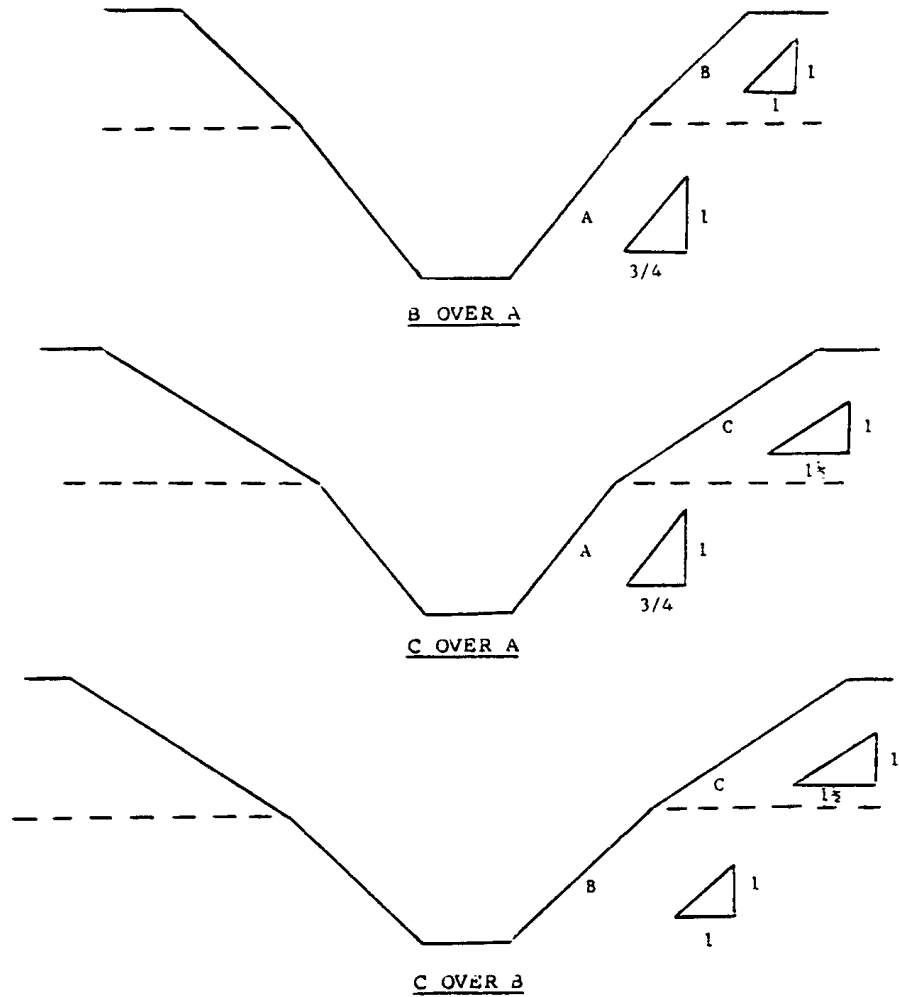
2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of $1\frac{1}{2}$:1.

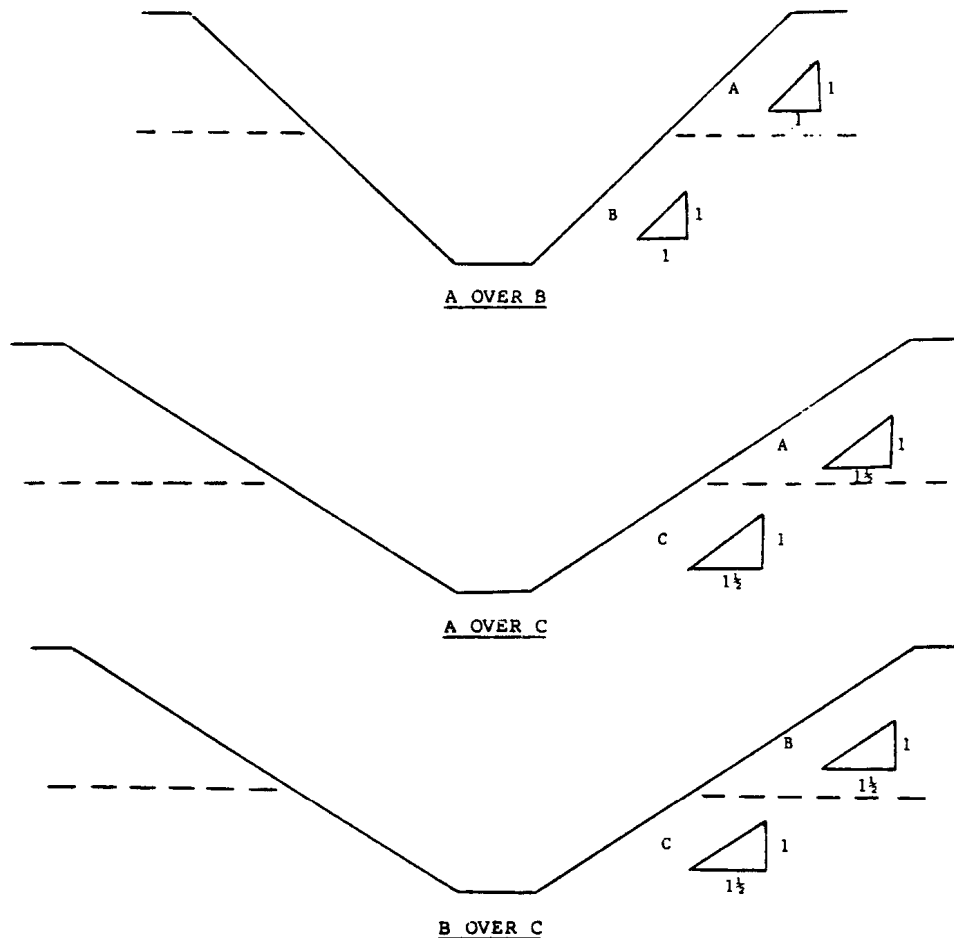


3. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

B-1.4 Excavations Made in Layered Soils

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.





2. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

APPENDIX C TO SUBPART P OF PART 1926—TIMBER SHORING FOR TRENCHES

(a) *Scope.* This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with § 1926.652(c)(1). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in § 1926.652(b) and § 1926.652(c).

(b) *Soil Classification.* In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of this part.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C-1.1, C-1.2, and C-1.3, and Tables C-2.1, C-2.2 and C-2.3 following paragraph (g) of the appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of

the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations regarding Tables C-1.1 through C-1.3 and Tables C-2.1 through C-2.3 are presented in paragraph (g) of this Appendix.

(d) *Basis and limitations of the data*—(1) *Dimensions of timber members.* (i) The sizes of the timber members listed in Tables C-1.1 through C-1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables C-1.1 through C-1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables C-2.1 through C-2.3, or have this choice under §1926.652(c)(3), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(2) *Limitation of application.* (i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in §1926.652(c).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with §1926.652.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables.* The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) *Examples to Illustrate the Use of Tables C-1.1 through C-1.3.*

(1) *Example 1.*

A trench dug in Type A soil is 13 feet deep and five feet wide.

From Table C-1.1, for acceptable arrangements of timber can be used.

Arrangement #B1

Space 4x4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3x8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #B2

Space 4x6 crossbraces at eight feet horizontally and four feet vertically.

Space 8x8 wales at four feet vertically.

Space 2x6 uprights at four feet horizontally.

Arrangement #B3

Space 6x6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8x10 wales at four feet vertically.

Space 2x6 uprights at five feet horizontally.

Arrangement #B4

Space 6x6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10x10 wales at four feet vertically.

Spaces 3x8 uprights at six feet horizontally.

(2) Example 2.

A trench dug in Type B soil in 13 feet deep and five feet wide. From Table C-1.2 three acceptable arrangements of members are listed.

Arrangement #B1

Space 6x6 crossbraces at six feet horizontally and five feet vertically.

Space 8x8 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

Arrangement #B2

Space 6x8 crossbraces at eight feet horizontally and five feet vertically.

Space 10x10 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

Arrangement #B3

Space 8x8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Space 2x6 uprights at two feet vertically.

(3) Example 3.

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C-1.3 two acceptable arrangements of members can be used.

Arrangement #B1

Space 8x8 crossbraces at six feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Position 2x6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #B2

Space 8x10 crossbraces at eight feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Position 2x6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) Example 4.

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C-1.3. Only one arrangement of members is provided.

Space 8x10 crossbraces at six feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Use 3x6 tight sheeting.

Use of Tables C-2.1 through C-2.3 would follow the same procedures.

(g) Notes for all Tables.

1. Member sizes at spacings other than indicated are to be determined as specified in §1926.652(c), "Design of Protective Systems."

2. When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

7. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

TABLE C-1.1
 TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE A $P_a = 25 \times H + 72 \text{ psf}$ (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **											
	CROSS BRACES						WALES			UPRIGHTS		
	WIDTH OF TRENCH (FEET)						VERT. SPACING (FEET)			MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)		
	HORIZ. SPACING (FEET)	UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15	VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	CLOSE	4	5
5	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---			
	UP TO 8	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---			2X8
10	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4			2X6
15	UP TO 10	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---			
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6	
20	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	8X10	4			
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4			3X8
25	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6		
30	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	3X6		
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	3X6		
OVER 20	SEE NOTE 1											

* Mixed oak or equivalent with a bending strength not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B $P_a = 45 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**										UPRIGHTS		
	CROSS BRACES					WALES		MAXIMUM ALLOWABLE HORIZONTAL SPACING					
	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)		SIZE (IN)			VERT. SPACING (FEET)		
	HORIZ. SPACING (FEET)	UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15		UP TO 4	UP TO 6	UP TO 8	UP TO 10	UP TO 12	UP TO 15
5 TO 10	UP TO 6	4X6	4X6	6X6	6X6	6X6	5	6X8	5		5		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	5	8X10	5		5		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	5	10X10	5		5		
	See Note 1												
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5		5		
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5		5		
	UP TO 10	8X8	8X8	8X8	8X8	8X10	5	10X12	5		5		
	See Note 1												
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5		5		
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5		5		
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5		5		
	See Note 1												
OVER 20	SEE NOTE 1												

* Mixed oak or equivalent with a bending strength not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE C P = 80 X H + 72 psf (2 ft. Surcharge)
 a

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**											
	CROSS BRACES						UPRIGHTS					
	HORIZ. SPACING (FEET)			WIDTH OF TRENCH (FEET)			VERT. SPACING (FEET)			MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)		
	UP TO 4	UP TO 6	UP TO 8	UP TO 9	UP TO 12	UP TO 15	SIZE (IN)	VERT. SPACING (FEET)	CLOSE			
5	UP TO 6	6X8	6X8	6X8	8X8	8X8	8X10	5	5	2X6		
TO	UP TO 8	8X8	8X8	8X8	8X8	8X10	10X12	5	5	2X6		
10	UP TO 10	8X10	8X10	8X10	8X10	10X10	12X12	5	5	2X6		
	See Note 1											
10	UP TO 6	8X8	8X8	8X8	8X8	8X10	10X12	5	5	2X6		
TO	UP TO 8	8X10	8X10	8X10	8X10	10X10	12X12	5	5	2X6		
15	See Note 1											
	See Note 1											
15	UP TO 6	8X10	8X10	8X10	8X10	10X10	12X12	5	5	3X6		
TO	See Note 1											
20	See Note 1											
	See Note 1											
OVER 20	SEE NOTE 1											

* Mixed Oak or equivalent with a bending strength not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE A $P_a = 25 \text{ X H} \pm 72 \text{ psf}$ (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S&S) AND SPACING OF MEMBERS **													
	CROSS BRACES						MALES		UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
5	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd					
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X6
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4		4X6			4X8
10	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd					4X10
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4		4X8			
15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	8X10	4		4X6			4X10
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4					
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4					
20	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	6X8	4		3X6			
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	8X8	4		4X12			
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4		3X6			
OVER 20	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4		4X12			
	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE B P_a = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	CROSS BRACES						MALES			UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3	4	6
5	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
TO	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
10	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	See Note 1													
10	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
TO	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
15	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	See Note 1													
15	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
TO	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
20	UP TO 10	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	See Note 1													
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **									
	CROSS BRACES					WALES		UPRIGHTS		
	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)		
	HORIZ. SPACING (FEET)	UP TO 4	UP TO 6	UP TO 9	UP TO 12			CLOSE		
5	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	3X6		
TO	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	3X6		
10	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	3X6		
	See Note 1									
10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	4X6		
TO	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	4X6		
15	See Note 1									
	See Note 1									
15	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	4X6		
TO	See Note 1									
20	See Note 1									
	See Note 1									
OVER 20	SEE NOTE 1									

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

APPENDIX D TO SUBPART P OF PART 1926—ALUMINUM HYDRAULIC SHOR- ING FOR TRENCHES

(a) *Scope.* This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that

do not exceed 20 feet (6.1m) in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with §1926.652(c)(2).

(b) *Soil Classification.* In order to use data presented in this appendix, the soil type or types in which the excavation is made must

first be determined using the soil classification method set forth in appendix A of subpart P of part 1926.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D-1.1, D-1.2, D-1.3 and E-1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D-1.1 and D-1.2 are for vertical shores in Types A and B soil. Tables D-1.3 and D-1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D-1.1 through D-1.4 are presented in paragraph (g) of this appendix.

(6) Figures, illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring; Typical Installations."

(d) *Basis and limitations of the data.* (1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 Tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications. (i) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of no less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(i) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be otherwise designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the Ta-

bles are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with § 1926.652.

(A) When vertical loads imposed on cross braces exceed a 100 Pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.

(B) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(C) When only the lower portion or a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables D-1.1, D-1.2, D-1.3 and D-1.4.* The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a waler system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D-1.1 and D-1.2 for vertical shores are used in Type A and B soils that do not require sheeting. Type B soils that may require sheeting, and Type C soils that always require sheeting are found in the horizontal wale Tables D-1.3 and D-1.4. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

(f) *Example to Illustrate the Use of the Tables:*

(1) Example 1:

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D-1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The

trench is 16 feet deep and 9 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote #B2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically, plywood (per footnote (g)(7) to the D-1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3x12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(5) Example 5: A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D-1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically. 3x12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) *Footnotes, and general notes, for Tables D-1.1, D-1.2, D-1.3, and D-1.4.*

(1) For applications other than those listed in the tables, refer to §1926.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to §1926.652(c)(2) and §1926.652(c)(3).

(2) 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5x3.5x0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

(3) Hydraulic cylinders capacities. (i) 2 inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

(5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.

(6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.

(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch. thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

(10) See appendix D, item (d), for basis and limitations of the data.

ALUMINUM HYDRAULIC SHORING TYPICAL INSTALLATIONS

FIGURE NO. 1
VERTICAL ALUMINUM
HYDRAULIC SHORING
(SPOT BRACING)

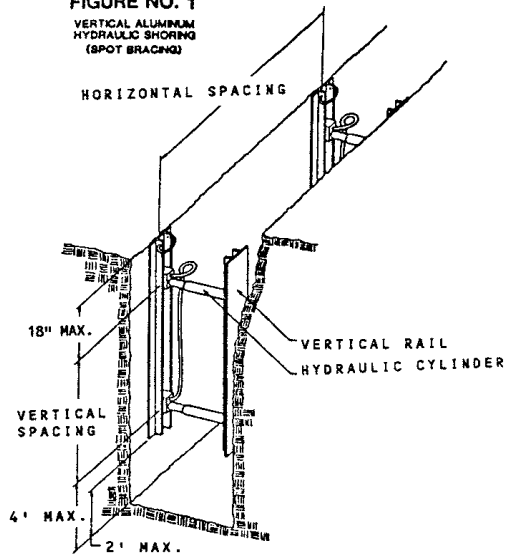


FIGURE NO. 2
VERTICAL ALUMINUM
HYDRAULIC SHORING
(WITH PLYWOOD)

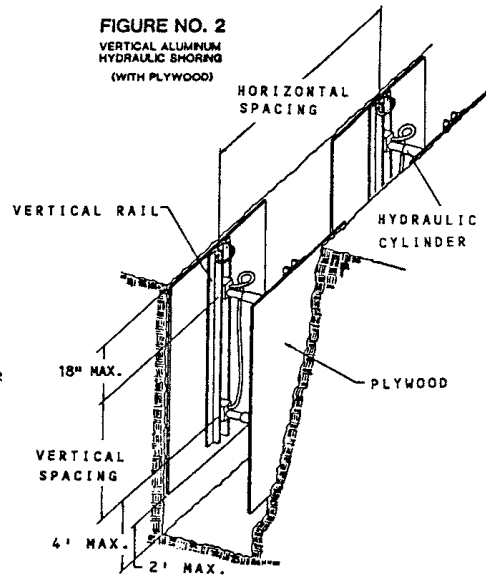


FIGURE NO. 3
VERTICAL ALUMINUM
HYDRAULIC SHORING
(STACKED)

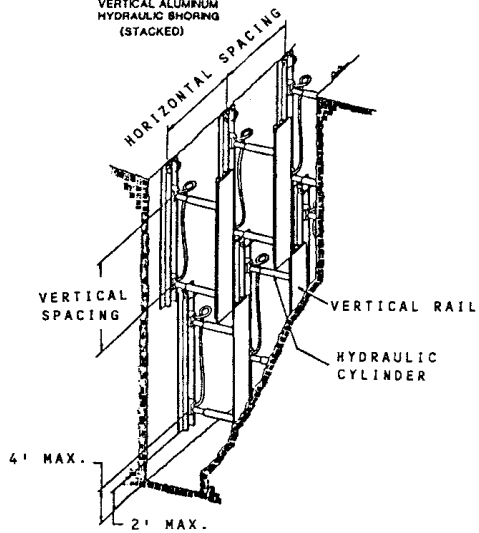


FIGURE NO. 4

ALUMINUM HYDRAULIC SHORING
WALER SYSTEM
(TYPICAL)

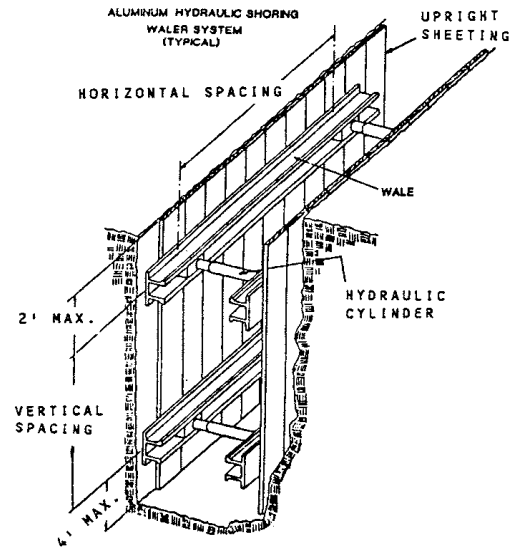


TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS			
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)	
			UP TO 8	OVER 8 UP TO 12
OVER 12 UP TO 15				
OVER 8 UP TO 15				
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)
OVER 10 UP TO 15	8			
OVER 15 UP TO 20	7			
OVER 20	NOTE (1)			

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B

HYDRAULIC CYLINDERS					
DEPTH OF TRENCH (FEET)	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.3
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS	
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)	
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER		
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE(2)	8.0	3 IN		
		7.0	9.0	2 IN	9.0	2 IN NOTE(2)	9.0	3 IN		3x12
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN		
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN		
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN	3x12	
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN		
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN NOTE(2)	5.5	3 IN		
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN	3x12	
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN		
OVER 20	NOTE (1)									

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

TABLE D - 1.4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE C

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS	
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)	
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	3 FT. 2 FT. 3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER		
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN		
		7.0	6.5	2 IN	6.5	2 IN NOTE(2)	6.5	3 IN	3x12	—
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN		
OVER 10 UP TO 15	4	3.5	4.0	2 IN	4.0	2 IN NOTE(2)	4.0	3 IN		
		7.0	5.5	3 IN	5.5	3 IN	5.5	3 IN	3x12	—
		14.0	8.0	3 IN	8.0	3 IN	8.0	3 IN		
OVER 15 UP TO 20	4	3.5	3.5	2 IN	3.5	2 IN NOTE(2)	3.5	3 IN		
		7.0	5.0	3 IN	5.0	3 IN	5.0	3 IN	3x12	—
		14.0	6.0	3 IN	6.0	3 IN	6.0	3 IN		
OVER 20			NOTE (1)							

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

APPENDIX E TO SUBPART P OF PART 1926—ALTERNATIVES TO TIMBER SHORING

Figure 1. Aluminum Hydraulic Shoring

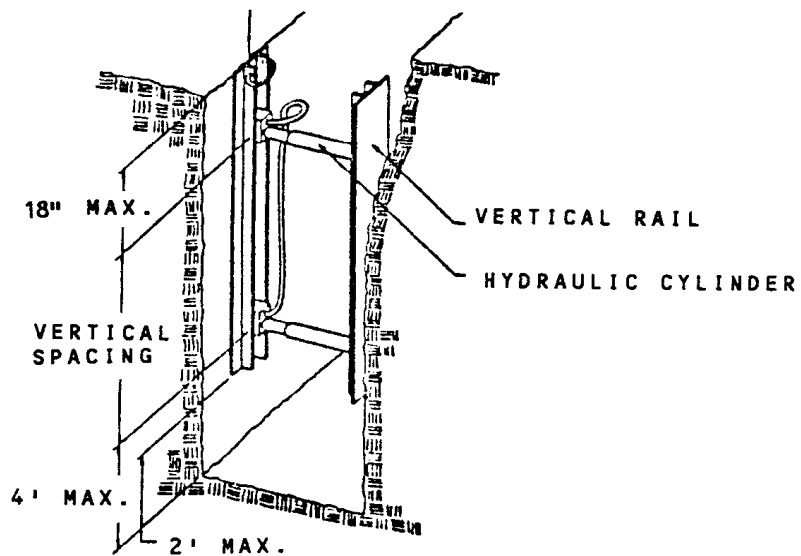


Figure 2. Pneumatic/hydraulic Shoring

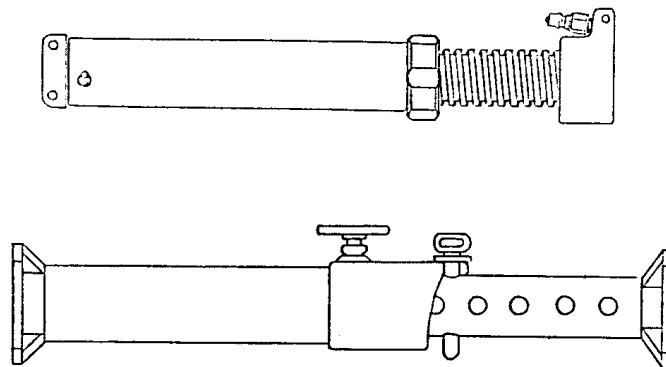


Figure 3. Trench Jacks (Screw Jacks)

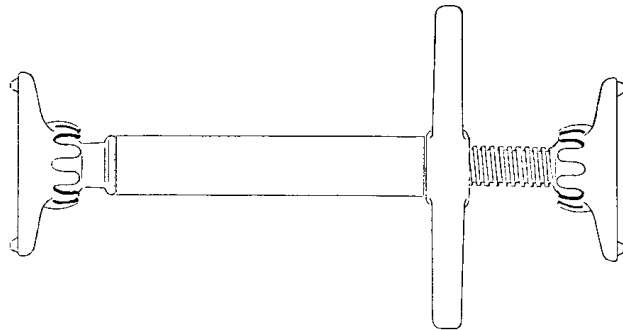
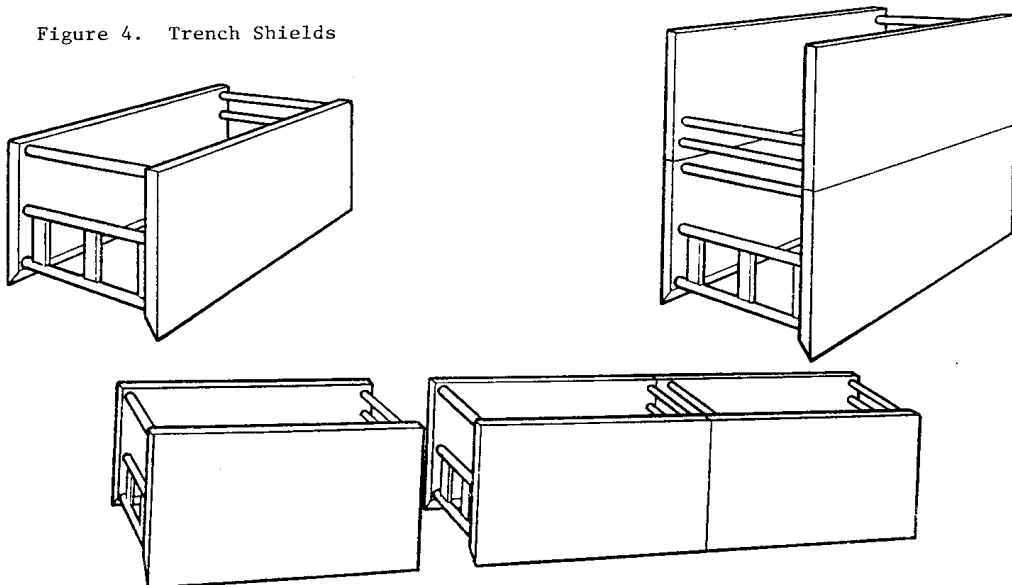


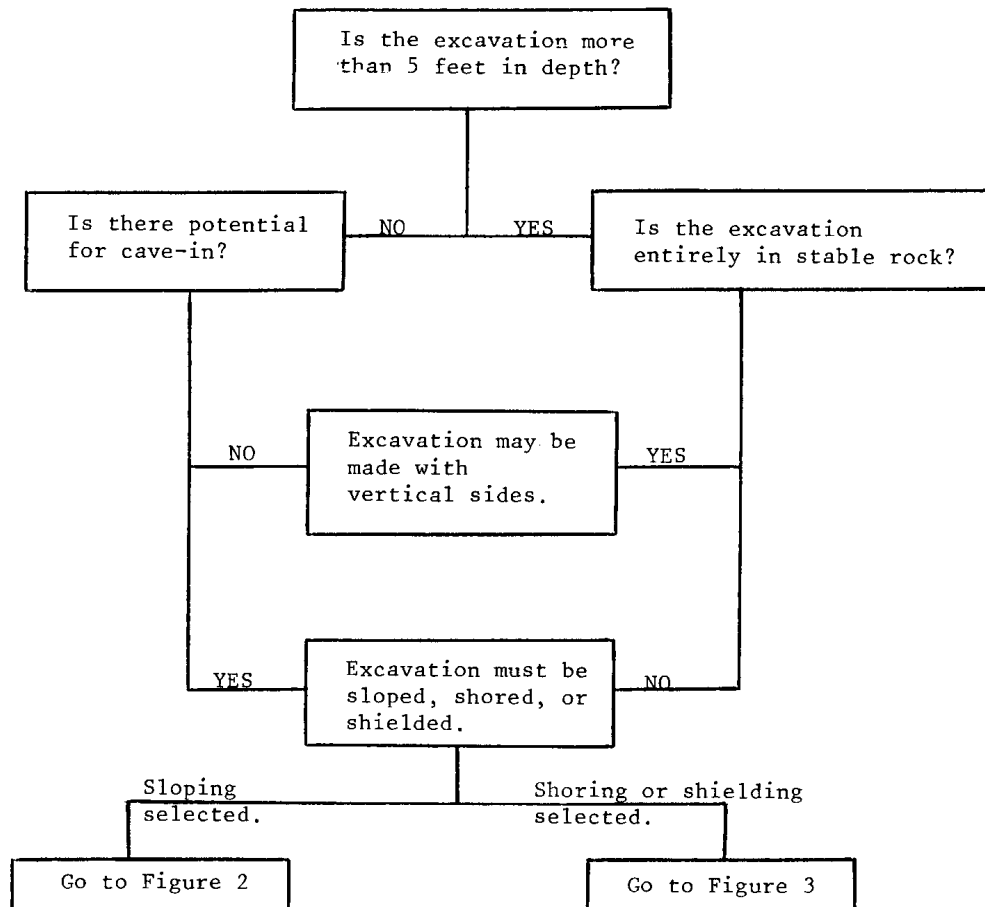
Figure 4. Trench Shields



APPENDIX F TO SUBPART P OF PART
1926—SELECTION OF PROTECTIVE
SYSTEMS

The following figures are a graphic summary of the requirements contained in sub-

part P for excavations 20 feet or less in depth. Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with §1926.652 (b) and (c).

FIGURE 1 - PRELIMINARY DECISIONS

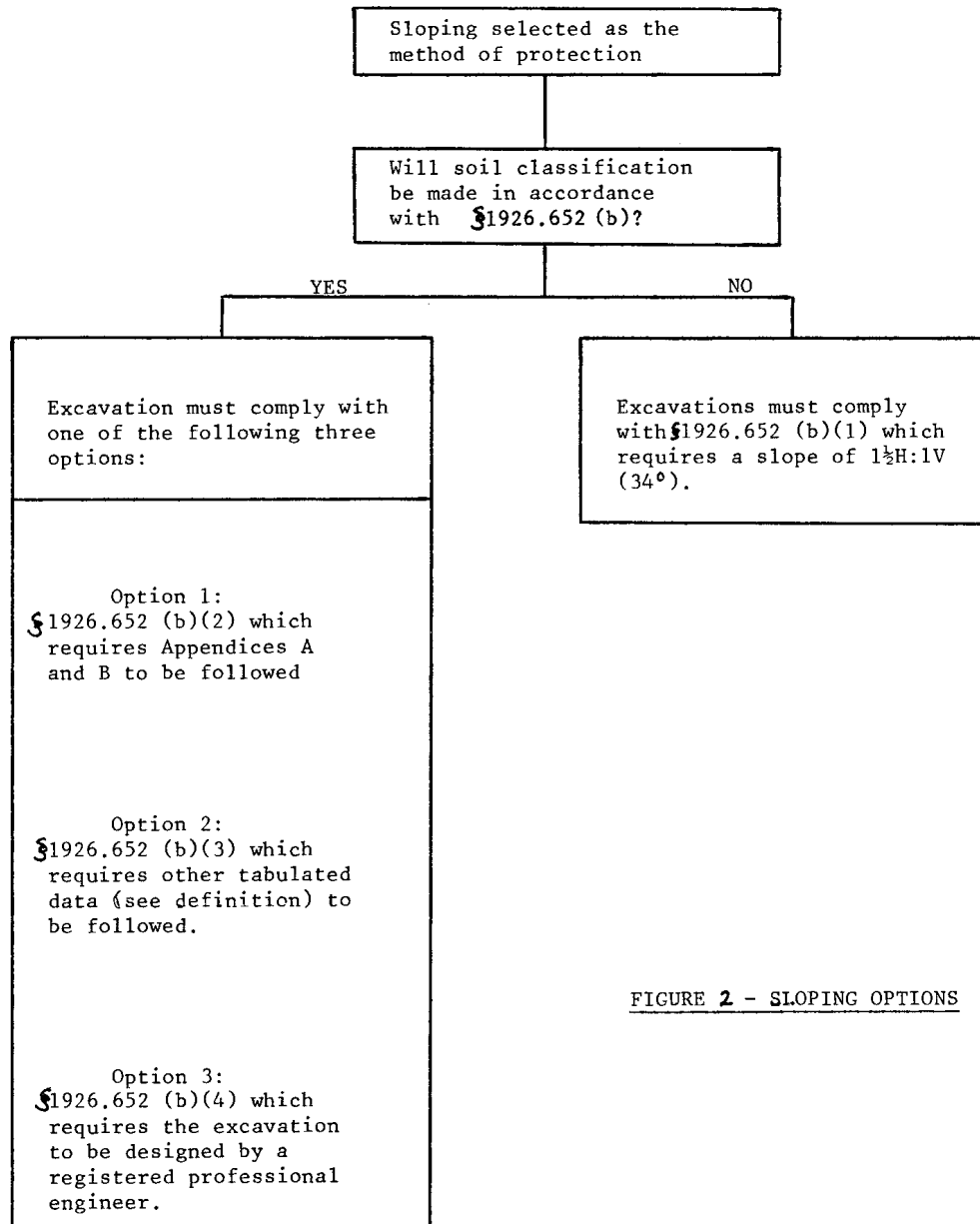


FIGURE 2 - SLOPING OPTIONS

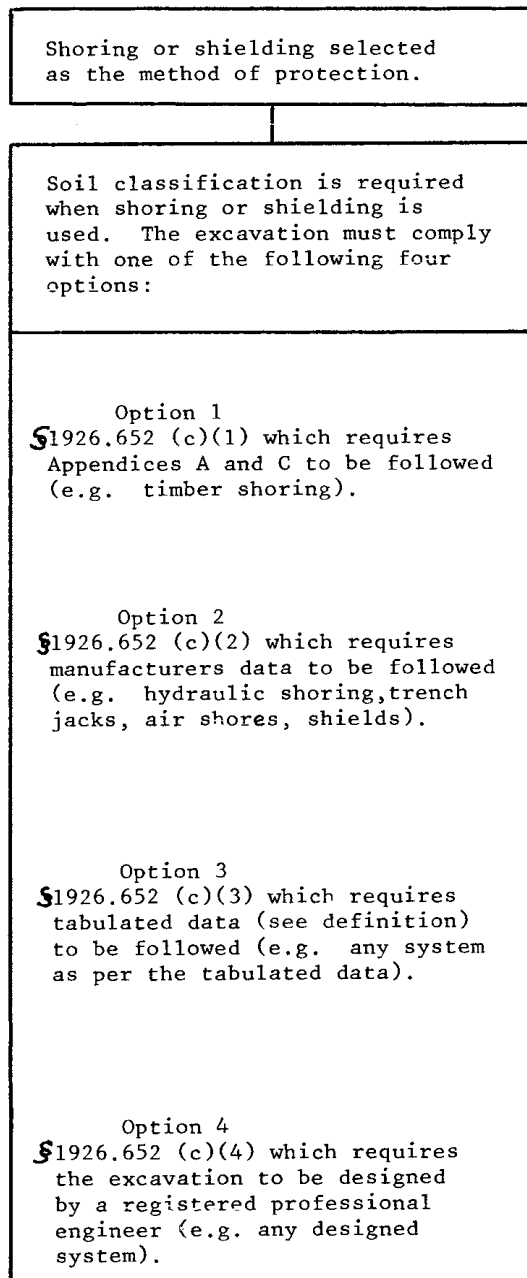


FIGURE 3 - SHORING AND SHIELDING OPTIONS

PART X

Technical Specifications

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HUNTSVILLE, TEXAS
NB-06 SANITARY SEWER REHABILITATION PROJECT
PROJECT NO. 20-10-06

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END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1—GENERAL

1.01 DIVISION ONE

- A. The requirements of Division 01 apply to all sections of the Contract.

1.02 PROJECT SCOPE

- A. CONTRACTOR shall provide all items, articles, materials, operations or methods mentioned or scheduled on the Drawings or herein specified: including all labor, supervision, equipment, incidentals, taxes, and permits necessary to complete the Work as described within the Contract Documents. CONTRACTOR shall install all items provided by OWNER as mentioned or scheduled on the Drawings or herein specified.

1.03 CONTRACT DOCUMENTS—INTENT AND USE

- A. Intent of Documents:
 - 1. Singular notations and specifications shall be considered plural where application is reasonably inferred.
 - 2. Mention or indication of extent of work under any division or Specification section is done only for convenience of CONTRACTOR and shall not be construed as describing all work required under that division or section.
 - 3. Some individual sections may contain a list of related sections. The list of related sections in individual sections is provided for the convenience of CONTRACTOR and is not necessarily all-inclusive. CONTRACTOR may not rely upon this listing for determination of scope of work. Other sections of the Specifications not referenced in individual sections shall apply as required for proper performance of the Work.
 - 4. Command type sentences may be used in the Contract Documents. These sentences refer to and are directed to CONTRACTOR.
 - 5. Symbols for various elements and systems are shown on the Drawings. Should there be any doubt regarding the meaning or intent of the symbols used, a written interpretation shall be obtained from ENGINEER.
- B. Use of Documents:
 - 1. CONTRACTOR shall examine all Specifications and Drawings for the Work, including those that may pertain to Work CONTRACTOR does not normally perform with its own forces.
 - 2. CONTRACTOR shall use all of the Project Drawings and Specifications:
 - a. For a complete understanding of the Project.
 - b. To determine the type of construction and systems required.
 - c. For coordination with other contractors.
 - d. To determine what other work may be involved in various parts or phases.
 - e. To anticipate and notify others when work by others will be required.
 - f. And all other relevant matters related to the project.
 - 3. CONTRACTOR is also bound by all requirements of the Contract Documents which are applicable to, pertain to, or affect its Work as may be shown or inferred by the entire set of Project Drawings and Specifications.

1.04 CONTRACTOR USE OF SITE

A. General:

1. The "area of the site" referred to in these Specifications shall be as shown on the Drawings. If the "area of the site" is not shown, OWNER's property lines, the Project right-of-way and/or any easements obtained for the Project shall be considered the "area of the site."
2. Construction activities shall be confined within the "area of the site" limits.
3. From the start of work to completion CONTRACTOR is responsible for the care of the site and the premises which are affected by operations of Work of this Contract.
4. Except for permanent site improvements provided under the Contract, CONTRACTOR shall restore property disturbed during the Work, to the conditions which previously existed.
5. Work in occupied spaces shall be restricted to specified Work and essential activities, such as making necessary connections and extending services or constructing temporary access ways. Such work shall be scheduled in advance with OWNER.

B. Parking and Deliveries:

1. CONTRACTOR is responsible for control of traffic by vehicles and persons within the limits of its operations.
2. Parking for employees, subcontractors, and agents of CONTRACTOR shall be in areas subject to approval of OWNER.
3. Access to the site for delivery of construction material or equipment shall be subject to approval of OWNER.

1.05 EXISTING SERVICES, OVERHEAD UTILITIES, AND UNDERGROUND FACILITIES INCLUDING STRUCTURES

- A. Interruption of existing services and systems including heating, ventilating, air conditioning, water, sanitary, lighting and power, signal and security will not be permitted unless specifically indicated otherwise. Provide temporary facilities to maintain services.
- B. If deemed necessary by OWNER, such work shall be accomplished after OWNER's normal office hours.
- C. Work shall not commence until all labor, materials, and equipment are available so Work can continue without interruption or delay.
- D. Should uncharted or incorrectly charted services or Underground Facilities be encountered during installation, notify OWNER and consult with utility owner immediately.
- E. Cooperate with OWNER and utility companies in keeping respective services and Underground Facilities in operation and repair any damage.
- F. CONTRACTOR shall not interrupt existing services and Underground Facilities occupied and used by OWNER or others, except when permitted in writing by OWNER.
- G. Any accidental interruption of services and Underground Facilities shall be repaired immediately, including provision of temporary facilities until permanent repairs can be made.

- H. Texas Utilities Code Section 251 requires, among other provisions, that before excavation or demolition begins, reasonable advance notice not less than three working days prior to the start of the excavation or demolition of the intent to excavate or demolish and the commencement date be provided to the owners of the Underground Facilities in and near the construction area whose facilities may be affected by the excavation or demolition. As part of this notification requirement, CONTRACTOR shall contact Texas 811 (811 or 1-800-344-8377). CONTRACTOR shall be aware that not all owners participate in the Texas 811 program. A call to this agency shall not absolve CONTRACTOR of the requirements of this statute. CONTRACTOR shall comply with all other provisions of the statute though not enumerated herein.
- I. Locations and elevations of services and Underground Facilities as shown on the Drawings are approximate. It shall be CONTRACTOR's responsibility to determine their exact location when in their vicinity. To this end, CONTRACTOR shall proceed with caution in the excavation and preparation of the Site so the exact location of services and Underground Facilities can be determined. CONTRACTOR shall include in the Contract Price any costs for temporary or permanent relocations of such services and Underground Facilities required to complete the Work unless specifically indicated otherwise in the Specifications.
- J. Where potential grade conflicts might occur with existing services and Underground Facilities, CONTRACTOR shall uncover such services and Underground Facilities sufficiently in advance of construction so that elevations may be determined to allow any necessary adjustments to be made.
- K. CONTRACTOR shall coordinate with overhead utility companies prior to the Work. CONTRACTOR shall provide all necessary temporary and permanent support relocation or temporary and permanent restraint to maintain overhead utilities in service.
- L. CONTRACTOR shall keep an accurate and complete record of all such services and Underground Facilities encountered and shall provide OWNER a copy of this record. The record shall include a description of the item encountered, opinion as to conditions, and adequate measurements and depths so that the item can be located in the future.
- M. CONTRACTOR shall inspect all services and Underground Facilities for condition and soundness. Unsound conditions shall be reported to OWNER immediately after exposing. CONTRACTOR shall not proceed with the Work until the service or facility owner has been notified. Service or facility owner shall then be given time to inspect and correct, if required, the service or Underground Facility. CONTRACTOR may make claim under the provisions of Articles 11 and 12 of the General Conditions should CONTRACTOR feel a price or time adjustment is justified.
- N. Any additional costs incurred because of failure of CONTRACTOR to report the condition of any and all existing services and Underground Facility encountered shall be paid for by CONTRACTOR.
- O. Whenever ENGINEER feels it is necessary to explore and excavate to determine the location of existing services and Underground Facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is required to perform additional Work in making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

1.06 PROTECTION OF WORK AND IMPROVEMENTS

- A. CONTRACTOR shall protect the property of OWNER, existing improvements, and the Work installed by CONTRACTOR and others from abuse, damage, dust, debris, and other objectionable materials resulting from construction activities.
- B. CONTRACTOR shall provide suitable covers, partitions, or other dust and fume containment devices to suit construction operations.
- C. CONTRACTOR shall keep property, existing improvements, and the Work including structures, mains, fittings, and accessories free from dirt and foreign matter at all times.
- D. CONTRACTOR shall provide temporary plugging of openings, holes, and pipe ends that are existing or that CONTRACTOR has installed.
- E. Property, improvements, and Work damaged by CONTRACTOR shall be repaired or replaced by CONTRACTOR to the satisfaction of OWNER.
- F. CONTRACTOR is cautioned that existing public and private streets, alleyways, and roads may not hold up to typical construction traffic or activities. CONTRACTOR shall repair or replace streets, alleyways, roads, and shoulders damaged by its construction activities to their original condition at CONTRACTOR's expense.

1.07 AVAILABILITY OF LANDS

- A. Easements were not obtained for this Project. CONTRACTOR shall confine its operations, equipment and storage areas to the easements, lands and rights-of-way in which the Project is to be located. CONTRACTOR may enter into written agreements with property owners for use of other lands during construction. Copies of such agreements shall be provided to OWNER.

PART 2-PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

- A. The following is a reference list of the OWNER-furnished equipment, materials, and agreements.
 - 1. List of OWNER-Furnished Materials and Hardware:
 - a. Fabricated gate signs indicating City of Huntsville easement location and access points.
 - b. Access gate pad locks.

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 29 00

CONTRACT CONSIDERATIONS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Cash Allowances.
 - 2. Measurement and Payment–Unit Prices.

1.02 CASH ALLOWANCES

- A. See Paragraph 11.02 of the General Conditions for costs to be included in allowances.
- B. Refer to sections of the specifications identified in the Bid Form for specific information on use of cash allowances.
- C. The Bid shall include the amount equal to the specified quantity times the unit price.

1.03 MEASUREMENT AND PAYMENT–UNIT PRICES

- A. Measurement methods are delineated in the individual Specification sections.
- B. CONTRACTOR shall take measurements and compute quantities. ENGINEER will check measurements and quantities.
- C. Incidental Items of Work: Any items of Work shown on the Drawings or called for in the Specifications, but not included in the Bid Form, shall be considered incidental items of Work. The cost of incidental items of Work shall be included in the prices bid for adjacent Work.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 31 00

COORDINATION, FIELD ENGINEERING, AND MEETINGS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Coordination.
 - 2. Field engineering.
 - 3. Progress meetings.

1.02 COORDINATION

- A. CONTRACTOR shall coordinate scheduling, submittals, and work of the various sections of the work to provide an efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. CONTRACTOR shall verify utility requirements and characteristics of operating equipment are compatible with building utilities and coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- C. CONTRACTOR shall coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings and shall follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, except as otherwise indicated, CONTRACTOR shall conceal pipes, ducts, and wiring within the construction and coordinate locations of fixtures and outlets with finish elements.
- E. CONTRACTOR shall coordinate completion and cleanup of Work of separate sections in preparation for substantial completion and for portions of Work designated for OWNER's occupancy.
- F. After OWNER occupancy of premises, CONTRACTOR shall coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents to minimize disruption of OWNER's activities.
- G. CONTRACTOR to provide door knockers to notify property owners that construction is commencing in the immediate area.
- H. Owner will provide notifications to ELRC, TxDOT, and other regulating agencies.

1.03 FIELD ENGINEERING

- A. CONTRACTOR shall locate and protect property stakes, legal survey monuments, benchmarks, and survey control and reference points. CONTRACTOR shall pay for replacement of disturbed property stakes and legal survey monuments by a Registered Land

Surveyor acceptable to OWNER and for replacement of benchmarks and survey control and reference points provided by ENGINEER.

- B. CONTRACTOR shall provide field engineering services as required to establish elevations, lines, and levels utilizing recognized engineering survey practices.
- C. CONTRACTOR shall furnish all required plummets and graduated poles to check all Work.
- D. If stakes and boards have to be reset because of negligence of CONTRACTOR, CONTRACTOR shall bear the cost of such work.
- E. If laser beam is used, CONTRACTOR shall check its Work against intermediate grade stakes provided between manholes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.
- F. If existing property stakes not within the limits of the trench are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.
- G. CONTRACTOR shall be responsible for all lines, elevations, and measurements of buildings, structures, piping, utilities, and other work executed by CONTRACTOR under the Contract. CONTRACTOR must exercise proper precaution to verify figures before laying out the Work and will be held responsible for any error resulting from its failure to exercise such precaution.
- H. Unless otherwise specified, lines and grades shall be furnished by ENGINEER or its representative. CONTRACTOR shall give ENGINEER a minimum notice of 72 hours and place where lines and grades will be needed. All stakes, marks, etc., damaged by CONTRACTOR, shall be replaced at CONTRACTOR's expense. CONTRACTOR shall also coordinate its request so that ENGINEER's work will be sufficient to cover the upcoming work for a period of at least one week.

1.04 PROGRESS MEETINGS

- A. Progress meetings will be held throughout progress of the Work at intervals agreed to by OWNER, ENGINEER, and CONTRACTOR. Interval will generally be monthly.
- B. CONTRACTOR's project manager, job superintendent, major subcontractors, and suppliers shall attend as appropriate to address agenda topics for each meeting. CONTRACTOR's representatives shall have authority to bind CONTRACTOR to decisions at the meetings.
- C. The project schedule shall be updated monthly and shall be reviewed at each progress meeting.
- D. CONTRACTOR shall also provide the following information in written form at each meeting.
 - 1. Construction progress, including:
 - a. Activities completed this reporting period.
 - b. Activities in progress this reporting period.
 - c. Activities scheduled to commence this reporting period.
 - 2. Description of problem areas.

3. Current and anticipated delays.
 - a. Cause of the delay.
 - b. Corrective action and schedule adjustments to correct the delay.
 - c. Impact of the delay on other activities, on milestones, and on completion dates.
4. Changes in construction sequence.

E. ENGINEER will prepare and distribute minutes to all attending parties.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
 - 2. To facilitate CONTRACTOR's understanding of the design intent, procedures have been established for advance submittal of design data and for its review or rejection by ENGINEER.
 - 3. The type of submittal requirements specified in this section include construction progress schedule, submittal schedule, shop drawings, product data, samples, maintenance manuals, and other miscellaneous work-related submittals.
- B. Related work described elsewhere: More detailed requirements for submittals are described in other sections of these specifications for some materials and equipment. They are to be considered additional requirements to supplement the requirements specified in this section. Submittals shall conform to Article 7 of the General Conditions.
- C. Definitions: "Electronic Submittal" is defined as any submittal transmitted electronically to ENGINEER for review.

1.02 IDENTIFICATION OF SUBMITTALS

- A. CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:
 - 1. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
 - 2. Name and location of project and identification number.
 - 3. Drawing number and specifications section number to which the submittal applies.
 - 4. Include the date of each submittal or resubmittal.

1.03 GROUPING OF SUBMITTALS

- A. Unless otherwise specifically permitted by ENGINEER, CONTRACTOR shall make all submittals in groups containing all associated items so that information is available for checking each item when it is received.
- B. Partial submittals may be rejected as not complying with the provisions of the Contract Documents.

1.04 TIMING OF SUBMITTALS

- A. CONTRACTOR shall make all submittals far enough in advance of scheduled dates of installation to provide required time for reviews, for securing necessary approval, for possible revision and resubmittal, and for placing orders and securing delivery.

- B. The review period for submittals that are received after 3 P.M. shall commence on the following business day.

1.05 CONSTRUCTION PROGRESS AND SUBMITTAL SCHEDULES

- A. Submit preliminary schedules within 10 days of the Effective Date of the Contract.
- B. Revise schedules incorporating any comments provided at the schedule review conference required in GC-2.07 and resubmit.
- C. As a minimum, the construction progress schedule shall consist of a horizontal bar chart with a separate line for each major portion of Work or operation, identifying first workday of each week.
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration for each activity. Identify activities that are on the critical path.
- E. Include line items for milestones (if any), Substantial, and Final Completion.
- F. Submit updated schedules with each Application for Payment, identifying changes since previous version.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates.

1.06 SHOP DRAWINGS

- A. Shop drawings shall include specially prepared technical data for this project including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for general application to a range of similar projects. Shop drawings shall be submitted for all manufactured or fabricated items. See individual technical sections for special requirements.
- B. CONTRACTOR shall make all shop drawings accurately to scale and sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
- C. Shop drawings shall be checked, approved, and stamped by CONTRACTOR in accordance with the General Conditions before transmittal to ENGINEER for review and approval.
- D. Complete shop drawings and descriptive data shall be submitted on all manufactured or fabricated items prior to 50% completion of the Work. Applications for payment beyond 50% of the Contract amount will not be recommended for payment until all shop drawings are submitted, including the required hard copies, or a revised schedule for any remaining submittals is agreed to by OWNER and ENGINEER.
- E. CONTRACTOR shall submit shop drawings following the electronic submittal procedure described below. If electronic submittal is impossible, CONTRACTOR may request ENGINEER to review hard copy submittals on a limited basis. If ENGINEER agrees to or requests hard copy submittal review, CONTRACTOR shall submit four color copies of shop

drawings and descriptive data to ENGINEER for approval. Three copies of these will be returned to CONTRACTOR if approved. If shop drawings are not approved or if they are stamped "Approved as Noted-Resubmit," two corrected copies will be returned to CONTRACTOR for use in resubmittal. If CONTRACTOR desires more than three approved copies, submitted quantity shall be increased accordingly.

- F. Shop drawings shall be submitted in 3-tab report covers, binder clips, or large envelopes.
- G. Shop drawings submitted to ENGINEER will be reviewed and stamped "Approved," "Approved as Noted," "Approved as Noted-Resubmit," or "Not Approved." CONTRACTOR shall resubmit the above number of corrected shop drawings for all shop drawings stamped "Approved as Noted-Resubmit" and "Not Approved" and will continue this process until shop drawings are stamped "Approved" or "Approved as Noted." If drawings are stamped "Approved as Noted-Resubmit," fabrication may proceed in accordance with the marked-up shop drawings. Installation shall not proceed until shop drawings have been resubmitted and stamped "Approved" or "Approved as Noted."
- H. If shop drawings are stamped "Approved as Noted" or "Approved as Noted-Resubmit" and CONTRACTOR does not agree with revisions or cannot conform with revisions, fabrication shall not proceed, and shop drawings shall be resubmitted with explanation of CONTRACTOR's position.
- I. All shop drawings used for construction site activities shall bear the "Approved" or "Approved as Noted" stamp of ENGINEER.
- J. Arrangements may be made between CONTRACTOR and ENGINEER to provide additional copies of "Approved" shop drawings for field activity purposes.
- K. PDF Submittal Procedures:
 - 1. Summary:
 - a. Shop drawing and product data submittals shall be transmitted to ENGINEER in electronic (PDF) format.
 - b. The intent of PDF submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - c. The PDF submittal process is not intended for color samples, color charts, or physical material samples.
 - 2. Procedures:
 - a. CONTRACTOR shall review and apply a stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer/product, dimensions and coordination of information with other parts of the work.
 - b. CONTRACTOR shall transmit each cover letter and submittal to ENGINEER as an e-mail attachment.
 - c. ENGINEER will return the reviewed shop drawing via e-mail with a transmittal letter, after review, indicating the status of the shop drawing review.
 - d. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of CONTRACTOR.
 - e. Electronically submitted shop drawings shall follow the following format:
 - (1) All files shall be delivered in PDF format with a minimum resolution of 300 dpi unless otherwise requested by ENGINEER. Scanned in material shall be scanned in color and any markings by CONTRACTOR shall be made in red.

Pages shall be rotated to the appropriate position for easy reading on a computer monitor such that the majority of text is vertical.

- (2) Files shall be delivered without security features activated.
- (3) Shop Drawings shall be uploaded as individual files. Files combined into a zip drive are not acceptable. All pages of one submittal should be contained in one file.
- (4) The file shall open to a cover page containing, at a minimum, the following information:
 - (a) CONTRACTOR's stamp.
 - (b) Name, e-mail, and telephone number of the individual who may be contacted for further information.
 - (c) Project number.
 - (d) Submittal number.
 - (e) Submission date, if resubmittal, all previous submission dates.
 - (f) Index detailing contents and the total number of pages in the submittal.
- f. Once a shop drawing has been "Approved" or "Approved as Noted," CONTRACTOR shall provide three hard color copies of the "Approved" or "Approved as Noted," shop drawings to ENGINEER. CONTRACTOR is responsible for the hard copy color replication of ENGINEER's "Approved" or "Approved as Noted," shop drawings for use by CONTRACTOR. Hard copy shop drawings shall be submitted in 3-ring binders or 3-tab report covers.

L. Shop drawings shall include verification that the item meets applicable codes and standards.

1.07 SAMPLES AND FIELD MOCKUPS

- A. CONTRACTOR shall provide samples and field mockups where noted or specified.
- B. Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the work will be judged.
- C. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product and full range of color, texture, and pattern.
- D. Samples shall have labels firmly attached, bearing the following information:
 - 1. Name of project.
 - 2. Description of product and finish.
 - 3. Name of CONTRACTOR.
 - 4. Trade name and number of product.
 - 5. Standards met by the product.
- E. Approval of samples must be obtained prior to proceeding with any work affected by material requiring sample approval.
- F. Samples, unless otherwise noted, become the property of OWNER.
- G. In situations specifically approved by ENGINEER, the retained sample may be used in the construction as one of the installed items.
- H. Field Mockups:
 - 1. CONTRACTOR shall erect field mockups at the project site in a location acceptable to ENGINEER and OWNER.

2. When accepted by ENGINEER, the mockup will become the basis for comparison of the actual work.
3. Remove mockup at conclusion of the work if it was not incorporated into the work.

1.08 PRODUCT DATA

- A. CONTRACTOR shall provide product data as required to supplement shop drawings.
- B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by CONTRACTOR to illustrate a material, product, or system for some portion of the work.
- C. CONTRACTOR shall collect required product data into one submittal for each unit of work or system.
- D. CONTRACTOR shall include manufacturer's standard printed recommendations for application and use, compliance with standards, performance characteristics, wiring and piping diagrams and controls, component parts, finishes, dimensions, required clearances, and other special coordination requirements.
- E. CONTRACTOR shall mark each copy of standard printed data to identify pertinent products, models, options, and other data.
- F. CONTRACTOR shall supplement manufacturer's standard data to provide information unique to the work.

1.09 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by ENGINEER.
- B. Shop Drawings and Product Data:
 1. Revise initial drawings or data and resubmit as specified for initial submittal.
 2. Itemize in a cover letter any changes which have been made other than those requested by ENGINEER.
- C. CONTRACTOR shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. ENGINEER will record ENGINEER's time for review subsequent submittals of shop drawings, samples, or other items required for approval and CONTRACTOR shall reimburse OWNER and ENGINEER's charges for such time.
- D. In the event that CONTRACTOR requests a substitution for previously approved item, CONTRACTOR shall reimburse OWNER for ENGINEER's charges for its review time unless the need for such change is beyond control of CONTRACTOR.

1.10 MAINTENANCE MANUAL

- A. Rotate pages viewed in landscape to the appropriate position for easy reading on a computer monitor.
- B. Bookmarks shall be created in the navigation frame for each entry in the Table of Contents. Three levels deep is usually enough (i.e., "Chapter," "Section," "Subsection"); however, complex submittals like instrumentation and electrical may be required at the discretion of

ENGINEER. When setting bookmarks for Chapter level heading, the page shall be displayed at Full Page. Section and Subsection level heading pages shall be displayed as a magnified view. Bookmarks shall be displayed as subordinate to other bookmarks in their hierarchy set so that only the Chapter level headings are displayed.

- C. Thumbnails shall be generated and embedded in each PDF file.
- D. Files shall be delivered without Security features activated. Password protected files will be unacceptable.
- E. The opening view for PDF files shall be set as follows:
 - 1. Initial View: Bookmarks and Page
 - 2. Magnification: Fit In Window
 - 3. Page Layout: Single Page
- F. The file shall open to the cover page of the Equipment O&M Manual with bookmarks to the left. The first bookmark shall be the name of Equipment O&M Manual.
- G. The submittal shall be delivered on CD after all Equipment O&M Manuals have been received and reviewed. Each CD shall be labeled, at a minimum, as follows:
 - 1. O&M title spelled out in complete words.
 - 2. Project and OWNER name.
 - 3. Month and date.
 - 4. Specification section number and title.
 - 5. Manufacturer name, point of contact, telephone number, and e-mail address as appropriate.
- H. CONTRACTOR shall reprocess any portion of the document that does not view or print to OWNER's satisfaction.
- I. CONTRACTOR is fully responsible for obtaining any and all copyright permissions associated with conversion of this information to electronic format.
- J. Each maintenance manual shall include a completed equipment maintenance summary form for each type and size of equipment being furnished that requires power, lubrication, or maintenance. Equipment Summary forms are located at the end of this section.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

EQUIPMENT MAINTENANCE SUMMARY FORM⁽¹⁾

Equipment	No.:		
_____	_____		
_____	_____		
_____	_____		
Specification Section: _____			
Equipment Name: _____			
Building Name: _____	Room No.: _____		
Plant Location: _____			
Manufacturer: _____			
Address: _____			
Phone: _____			
Service Representative: _____			
Address: _____			
Phone: _____	Fax: _____		
Make: _____	Model: _____		
Serial No.: _____	Type: _____		
Size: _____	_____		
Equipment Speed: _____			
Capacity: _____			
Operating Range: _____			
Material: _____			
Alarms: _____			

Drive Ratio: _____			
Motor Speed: _____	Service Factor: _____		
Volts: _____	Phase: _____	hp: _____	Efficiency: _____
Motor Type: _____			
Motor Sensors: _____			
Motor Manufacturer: _____			
Model: _____	Motor Frame: _____		
Insulation Class: _____			
FLA: _____		LRA: _____	

(1) Complete as applicable; attach supplementary pages as necessary.

Maintenance Requirements

(Use additional sheets if more space is needed.)

LUBRICATION

<u>Item</u>	<u>Generic Type of Lubricant</u>	<u>Supplier</u>	<u>Estimated Frequency</u>	<u>Annual Quantity</u>

PREVENTIVE MAINTENANCE

<u>Item</u>	<u>Action</u>	<u>Frequency</u>	<u>Reference</u>

SUGGESTED MINIMUM SPARE PARTS LIST

<u>Manufacturer</u>	<u>Part No.</u>	<u>Quantity Unit</u>	<u>Description</u>

The following information is included in O&M Manual:

Check or mark N/A

1.	Recommended installation, adjustment, calibration, and troubleshooting.	_____
2.	Complete internal and connection wiring diagrams.	_____
3.	Complete parts lists, by generic title and identification number, with exploded views of each assembly.	_____
4.	Disassembly, overhaul, and reassembly instructions.	_____
5.	Recommended prestart checks.	_____
6.	Recommended start procedure.	_____
7.	Recommended shutdown procedure for both short and long term.	_____
8.	Recommended operating precautions that include safety for personnel and equipment.	_____
9.	Recommended standing maintenance procedure.	_____

END OF SECTION

SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. OSHA requirements.
 - 2. Roadway limits.
 - 3. Permits.
 - 4. Wage rates.

1.02 OSHA REQUIREMENTS

- A. All work including site safety, equipment, materials, and fabricated items provided under the Contract shall comply with the provisions of the "Occupational Safety and Health Act."

1.03 ROADWAY LIMITS

- A. CONTRACTOR shall comply with roadway weight restrictions including seasonal weight restrictions.

1.04 PERMITS

- A. The following permits will be obtained:
 - 1. Texas Department of Transportation.
 - 2. Texas Commission on Environmental Quality.
- B. The permits will be provided once obtained. CONTRACTOR shall comply with all provisions of these permits and shall be responsible for notifications as required by these permits. CONTRACTOR shall obtain all other permits required for the Work. Where the requirements of any permit are more restrictive than the Drawings or the Specifications, the permit requirements shall govern.
- C. Any permits required for dewatering operations shall be obtained and paid for by CONTRACTOR.

1.05 WAGE RATES

- A. Wage rates not less than these rates must be paid on this Project, including fringe benefits. CONTRACTOR shall post the Prevailing Wage Rate Determination in a prominent and easily accessible location at the project site and shall abide by all associated laws and regulations pertaining thereto.
- B. CONTRACTOR shall also comply with the attached Federal Wage Rates.
- C. Not less than the prevailing wage rates for this area shall be paid to the workers employed to do the Work under this Contract.

- D. See Wage Rate Forms bound in Part VII—Federal Labor Standards Provisions & Davis Bacon Wage Rates.

PART 2—PRODUCTS

NOT APPLICABLE

PART 3—EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 42 00

REFERENCE STANDARDS AND DEFINITIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Reference Standards:
 - a. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
 - b. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is CONTRACTOR's responsibility to provide materials and workmanship which meet or exceed that specifically named code or standard.
 - c. It is also CONTRACTOR's responsibility, when so required by the Contract Documents, to deliver to ENGINEER all required proof that the material or workmanship, or both, meet or exceed the requirements of the specifically named code or standard.
 - 2. Definitions:
 - a. A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including the Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon.
 - b. Certain terms used in the Contract Documents are defined generally in this section to supplement definitions of the Agreement, General Conditions, Supplementary Conditions, and other general contract documents.
 - c. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the Work.
- B. Related Work Described Elsewhere: The specific naming of codes or standards occurs on the Drawings and in other sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Familiarity with Pertinent Codes and Standards:
 - 1. It is CONTRACTOR's responsibility to verify the requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.
 - 2. When required by individual sections of these specifications, CONTRACTOR shall obtain a copy of each pertinent code or standard and maintain the copies at the job site during submittals, planning, and progress of the Work until Substantial Completion of the Work is attained.
- B. Overlapping or Conflicting Requirements:
 - 1. Where compliance with two or more industry standards or sets of requirements are specified, and the overlapping of those standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (which is

generally recognized to be also most costly) is intended and will be enforced, unless more detailed language written directly into Contract Documents clearly indicates that a less stringent requirement is acceptable.

2. Refer all uncertainties to ENGINEER for decision before proceeding.

1.03 REFERENCE STANDARDS

- A. Applicable standards of the construction industry are made a part of the Contract Documents by reference as if copied directly into the Contract Documents, or as if published copies were bound herewith. See Article 3.02 of the General Conditions for additional provisions regarding references.
- B. Standards referenced directly in the Contract Documents or by governing regulation, have precedence over nonreferenced standards which are recognized in industry for applicability to the Work.
- C. Nonreference standards are hereby defined to have no particular applicability to the Work except as a general measurement of whether the Work complies with standards recognized in the construction industry.
- D. Reference standards and codes listed in these specifications may include, but are not necessarily limited to, standards or codes published by the following agencies and organizations:

1. AA Aluminum Association
1525 Wilson Boulevard, Arlington, VA 22209
2. AAMA American Architectural Manufacturer's Association
1827 Walden Office Square Suite 550, Schaumburg, IL 60173-4268
3. AASHTO American Association of State Highway & Transportation Officials
444 North Capitol Street NW Suite 249, Washington, DC 20001
4. ACI American Concrete Institute
38800 Country Club Drive, Farmington Hills, MI 48331-3439
5. AI Asphalt Institute
2696 Research Park Drive, Lexington, KY 40511-8480
6. AISC American Institute of Steel Construction
One East Wacker Drive Suite 700, Chicago, IL 60601-1802
7. AISI American Iron and Steel Institute
25 Massachusetts Avenue NW Suite 800, Washington, DC 20001
8. ANSI American National Standards Institute
25 West 43rd Street, New York, NY 10036
9. APA American Plywood Association
7011 South 19th, Tacoma, WA 98466-5333

10. API American Petroleum Institute
1220 L Street NW, Washington, DC 20005-4070
11. ARI Air-Conditioning & Refrigeration Institute
4100 North Fairfax Drive Suite 200, Arlington, VA 22203
12. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
1791 Tullie Circle NE, Atlanta, GA 30329
13. ASME American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990
14. ASSE American Society of Sanitary Engineering
901 Canterbury Suite A, Westlake, OH 44145
15. ASTM ASTM International
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
16. AWI Architectural Woodwork Institute
46179 Westlake Drive Suite 120, Potomac Falls, VA 20165-5874
17. AWPA American Wood Protection Association
P.O. Box 361784, Birmingham, AL 35236-1784
18. AWS American Welding Society
8669 Doral Boulevard Suite 130, Doral, FL 33166
19. AWWA American Water Works Association
6666 West Quincy Avenue, Denver, CO 80235
20. BHMA Builder's Hardware Manufacturers Association
355 Lexington Avenue 15th floor, New York, NY 10017
21. BIA Brick Industry Association
1850 Centennial Park Drive Suite 301, Reston, VA 20191
22. CRSI Concrete Reinforcing Steel Institute
9333 North Plum Grove Road, Schaumburg, IL 60173
23. DOT U.S. Department of Transportation
1200 New Jersey Avenue, SE, Washington, DC 20590
24. EJMA Expansion Joint Manufacturers Association
25 North Broadway, Tarrytown, NY 10591
25. FM FM Global
FM Global Corporate Offices, 270 Central Avenue, Johnston, RI 02919

26. FTI Facing Tile Institute
Box 8880, Canton, OH 44711
27. GA Gypsum Association
6525 Belcrest Road Suite 480, Hyattsville, MD 20782
28. GANA Glass Association of North America
800 SW Jackson Street Suite 1500, Topeka, KS 66612-1200
29. ICC International Code Council
500 New Jersey Avenue NW 6th Floor, Washington, DC 20001
30. IES Illuminating Engineering Society
120 Wall Street, Floor 17, New York, NY 10005-4001
31. MIL Military Specifications
Naval Publications and Forms Center
5801 Tabor Avenue, Philadelphia, PA 19120
32. NAAMM National Association of Architectural Metal Manufacturers
800 Roosevelt Road Building C Suite 312, Glen Ellyn, IL 60137
33. NCMA National Concrete Masonry Association
13750 Sunrise Valley Drive, Herndon, VA 20171-4662
34. NECA NECA
National Electrical Contractors Association
3 Bethesda Metro Center Suite 1100, Bethesda, MD 20814
35. NEMA National Electrical Manufacturers Association
1300 North 17th Street Suite 1752, Rosslyn, VA 22209
36. NFPA National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02169-7471
37. NIST National Institute of Standards and Technology
(U.S. Department of Commerce), 100 Bureau Drive, Stop 1070
Gaithersburg, MD 20899-1070
38. NRCA National Roofing Contractors Association
10255 West Higgins Road Suite 600, Rosemont, IL 60018-5607
39. NSF National Sanitation Foundation International
P.O. Box 130140, 789 North Dixboro Road, Ann Arbor, MI 48113-0140
40. OSHA Occupational Safety & Health Administration
200 Constitution Avenue NW, Washington, DC 20210
41. PCA Portland Cement Association
5420 Old Orchard Road, Skokie, IL 60077

- 42. PCI Prestressed Concrete Institute
200 West Adams Street Suite 2100, Chicago, IL 60606

- 43. SAE Society of Automotive Engineers
SAE World Headquarters
400 Commonwealth Drive, Warrendale, PA 15096-0001

- 44. SDI Steel Deck Institute
P.O. Box 25, Fox River Grove, IL 60021

- 45. SDI Steel Door Institute
30200 Detroit Road, Westlake, OH 44145-1987

- 46. SIGMA Sealed Insulating Glass Manufacturers Assoc.
401 North Michigan Avenue Suite 2400, Chicago, IL 60611

- 47. SJI Steel Joist Institute
234 Cheves Street, Florence, SC 29501

- 48. SMACNA Sheet Metal and Air Conditioning
Contractor's National Association
4201 Lafayette Center Drive, Chantilly, VA 20151-1219

- 49. SSPC Society for Protective Coatings
40 24th Street 6th Floor, Pittsburgh, PA 15222-4656

- 50. TCA Tile Council of America
100 Clemson Research Boulevard, Anderson, SC 29625

- 51. UL Underwriters Laboratories
333 Pfingston Road; Northbrook, IL 60062

1.04 SUBMITTALS

- A. For OWNER's records, CONTRACTOR shall submit copies of permits, licenses, certifications, inspection reports, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.05 DEFINITIONS

- A. Indicated:
 - 1. The term "indicated" is a cross-reference to details, notes, or schedules on the drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in the Contract Documents.
 - 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate cross-reference, and no limitation is intended except as specifically noted.

- B. Approve (or Words of Similar Nature):
1. Where used in conjunction with ENGINEER's response to submittals, requests, applications, inquiries, reports, and claims by CONTRACTOR, the meaning of the term "approve" will be held to the limitation of ENGINEER's responsibilities and duties as specified in Paragraph 1.02.B of the General Conditions.
 2. In no case will "approval" by ENGINEER be interpreted as a release of CONTRACTOR from responsibility to fulfill requirements of the Contract Documents.
- C. Minimum Requirements:
1. Indicated requirements are for a specific minimum acceptable level of quality or quantity, as recognized in the industry.
 2. Actual work must comply with (or within specified tolerances) or exceed minimums.
 3. CONTRACTOR shall refer uncertainties to ENGINEER before proceeding.
- D. Abbreviations: Abbreviations, where not defined in the Contract Documents, will be interpreted to mean the normal construction industry terminology.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1—GENERAL

1.01 SUMMARY

- A. Work Includes:
 - 1. Quality Assurance—Control of Installation.
 - 2. Tolerances.
 - 3. Manufacturers' Field Services and Reports.

1.02 QUALITY ASSURANCE—CONTROL OF INSTALLATION

- A. CONTRACTOR shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.
- B. CONTRACTOR shall comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER before proceeding.
- D. CONTRACTOR shall comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. CONTRACTOR shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. CONTRACTOR shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.
- B. CONTRACTOR shall comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER before proceeding.
- C. CONTRACTOR shall adjust products to appropriate dimensions; position before securing products in place.

1.04 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections or when requested by ENGINEER, CONTRACTOR shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, and quality of workmanship.

- B. CONTRACTOR shall submit qualifications of observer to ENGINEER 30 days in advance of required observations.
- C. CONTRACTOR shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. CONTRACTOR shall submit report in duplicate within 30 days of observation to ENGINEER for information.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Temporary utilities.
 - 2. Temporary stairs and access.
 - 3. Removal of temporary facilities.
- B. CONTRACTOR shall arrange for and provide temporary facilities as required for proper and expeditious prosecution of the Work.
- C. CONTRACTOR shall pay all costs, except as otherwise specified, until final acceptance of the Work unless OWNER makes arrangements for use of completed portions of the Work after substantial completion in accordance with the provisions of the General Conditions.
- D. CONTRACTOR shall make all temporary connections to utilities and services in locations acceptable to OWNER and local authorities having appropriate jurisdiction.
 - 1. Furnish all necessary labor and materials.
 - 2. Make all installations in a manner subject to the acceptance of such authorities and OWNER.
 - 3. Maintain such connections.
 - 4. Remove temporary installation and connection when no longer required.
 - 5. Restore services and sources of supply to proper operating conditions.

1.02 TEMPORARY UTILITIES

- A. Temporary Toilets: CONTRACTOR shall provide and maintain sanitary temporary chemical toilets located where approved by OWNER and in sufficient number required for the work force employed by CONTRACTOR.
- B. Temporary Electrical Services:
 - 1. Existing outlets and wiring shall not be used for motors larger than fractional HP or for welding equipment. Circuits for larger motors and welding equipment may be provided with special circuits to mains of electrical panels at the expense of those trades requiring them, provided that written permission is obtained from OWNER and ENGINEER.
 - 2. Any temporary electrical services required during power outages shall be obtained and paid for by CONTRACTOR.
 - 3. All temporary lighting required for construction as well as OWNER's full use of the entire facility throughout construction shall be provided by CONTRACTOR.
 - 4. No permanent electrical equipment or wiring shall be used without express written permission of OWNER. Such approval, if given, shall not affect guarantee period.
- C. Weather Protection: CONTRACTOR shall provide weather protection to protect the Work from damage because of freezing, rain, snow, and other inclement weather.

- D. Temporary Water: CONTRACTOR shall supply its own water during construction. CONTRACTOR shall also provide its own piping, valves, and appurtenances for its requirements. Connection to the existing water system shall be coordinated with OWNER and shall meet all code requirements including disinfection and backflow prevention.

1.03 TEMPORARY STAIRS AND ACCESS

- A. CONTRACTOR shall provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, chutes, and so on as required for proper execution of the Work. CONTRACTOR shall be responsible for providing its own scaffolds, hoists, etc.
- B. All such apparatus, equipment, and construction shall meet all requirements of OSHA, the labor laws, and other applicable State and local laws. Provide stairs with handrails. As soon as possible and where applicable, permanent stairs shall be installed.
- C. As soon as permanent stairs are created, provide temporary protective treads, handrails, and shaft protection.
- D. Provide barricades at hazardous locations, complete with signs, temporary general lighting, warning lights, and similar devices as required.

1.04 REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary materials, equipment, services, and construction as soon as practicable but no later than just prior to final completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities and restore existing facilities used during construction to specified, or to original, condition.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Dust Control.
 - 2. Water, Erosion, and Sediment Control.
 - 3. Noise Control.
 - 4. Traffic Control.
 - 5. Site Security.
 - 6. Daily Cleanup.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 DUST CONTROL

- A. CONTRACTOR shall execute the Work by methods to minimize raising dust from construction operations.
- B. CONTRACTOR shall provide positive means to prevent airborne dust from dispersing into atmosphere.
- C. CONTRACTOR shall provide partitions, enclosures, etc., within buildings as necessary to confine dust and protect adjacent areas.

3.02 WATER, EROSION, AND SEDIMENT CONTROL

- A. CONTRACTOR shall grade site to drain and shall maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. CONTRACTOR shall protect Site from puddling or running water.
- C. CONTRACTOR shall provide erosion control measures as necessary to control discharge of sediment laden water to surface waters and wetlands.
- D. Except as provided for in the document, overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins or other such structures or features prior to discharge to surface waters so as not to cause damage to existing ground and improvements, erosion, or deposition in the discharge area.

- E. CONTRACTOR shall use jute or synthetic netting, silt fences, straw bales, dikes, channels, and other applicable measures to prevent erosion of soils disturbed by its construction operation.
- F. Restoration of the Site shall proceed concurrently with the construction operation. See Drawings and Specifications for erosion control measures in addition to that which may be required above.

3.03 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

3.04 TRAFFIC CONTROL

- A. CONTRACTOR shall be responsible for providing all signs, barricades, flagmen, and other traffic control devices in the construction zone.
- B. Conduct operations with minimum interference to roadways.
- C. Do not close or obstruct roadways without approval of OWNER.
- D. Maintain two-way traffic on streets, at all times.

3.05 SITE SECURITY

- A. CONTRACTOR shall have the sole responsibility of safeguarding the Site perimeter to prevent unauthorized entry to the Site throughout the duration of the Project. CONTRACTOR shall at all times provide such permanent and temporary fencing or barricades or other measures as may be necessary to restrict unauthorized entry to its construction area including construction in public rights-of-way or easements. Site security measures shall include safeguards against attractive nuisance hazards as a result of construction activity.
- B. CONTRACTOR shall at all times be responsible for the security of the Work including materials and equipment. OWNER will not take any responsibility for missing or damaged equipment, tools, or personal belongings. CONTRACTOR shall have the sole responsibility of safeguarding the Work and the Site throughout the duration of the Project.

3.06 DAILY CLEANUP

- A. CONTRACTOR shall clean up the Site and remove all rubbish on a daily basis.
- B. CONTRACTOR shall clean up public streets and highways and remove any dirt, mud, or other materials due to project traffic on daily basis and shall comply with all local and state ordinances and permit requirements.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: CONTRACTOR shall be responsible for the delivery, handling, storage and protection of all material and equipment required to complete the Work as specified herein.
- B. Related Sections and Divisions: Specific requirements for the handling and storage of material and equipment are described in other sections of these Specifications.

1.02 PRODUCTS

- A. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.
- B. CONTRACTOR shall not use materials and equipment removed from existing construction, except as specifically required, or allowed, by the Contract Documents.
- C. When any construction deviations from the Drawings and/or Specifications necessary to accommodate equipment supplied by CONTRACTOR, result in additional costs to CONTRACTOR or other contractors, such additional costs shall be borne by CONTRACTOR. CONTRACTOR shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.
- D. Each major component of equipment shall bear a nameplate giving the name and address of the manufacturer and the catalogue number or designation.

1.03 TRANSPORTATION AND HANDLING

- A. Materials, products and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.
- B. CONTRACTOR shall not overload any portion of the structure in the transporting or storage of materials.
- C. CONTRACTOR shall not damage other construction by careless transportation, handling, spillage, staining or impact of materials.
- D. CONTRACTOR shall provide equipment and personnel to handle products, including those provided by OWNER, by methods to prevent soiling and damage.
- E. CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.
- F. CONTRACTOR shall handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.04 DELIVERY AND RECEIVING

- A. CONTRACTOR shall arrange deliveries of products in accordance with the Progress Schedule, allowing time for observation prior to installation.
- B. CONTRACTOR shall coordinate deliveries to avoid conflict with the Work and conditions at the Site; work activities of other contractors or OWNER; limitations on storage space; availability of personnel and handling equipment and OWNER's use of premises.
- C. CONTRACTOR shall deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.
- D. CONTRACTOR shall clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately on delivery, CONTRACTOR shall inspect shipment to review that:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.
 - 4. Containers and packages are intact and labels legible.
 - 5. Products are protected and undamaged.

1.05 STORAGE AND PROTECTION

- A. General:
 - 1. CONTRACTOR shall store products, immediately on delivery, in accordance with manufacturer's instructions, with all seals and labels intact and legible.
 - 2. Any additional off-site space required shall be arranged by CONTRACTOR.
 - 3. CONTRACTOR shall allocate the available storage areas and coordinate their use by the trades on the job.
 - 4. CONTRACTOR shall arrange storage in a manner to provide access for maintenance of stored items and for observation.
- B. In enclosed storage, CONTRACTOR shall:
 - 1. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
 - 2. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
 - 3. Provide ventilation for sensitive products as required by manufacturer's instructions.
 - 4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
 - 5. Store solid materials such as insulation, tile, mechanical and electrical equipment, fittings, and fixtures under shelter, in original packages, away from dampness and other hazards.
 - 6. Store liquid materials away from fire or intense heat and protect from freezing.
- C. At exterior storage, CONTRACTOR shall:
 - 1. Store unit materials such as concrete block, brick, steel, pipe, conduit, door frames, and lumber off ground, out of reach of dirt, water, mud and splashing.
 - 2. Store tools or equipment that carry dirt outside.
 - 3. Store large equipment so as not to damage the Work or present a fire hazard.
 - 4. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet material and provide ventilation to avoid condensation.

5. Completely cover and protect any equipment or material which is prime coated or finish painted with secured plastic or cloth tarps. Store out of reach of dirt, water, mud and splashing.
6. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
7. Provide surface drainage to prevent erosion and ponding of water.
8. Prevent mixing of refuse or chemically injurious materials or liquids.
9. Cover aggregates such as sand and gravel in cold wet weather.
10. Remove all traces of piled bulk materials at completion of work and return site to original or indicated condition.

1.06 MAINTENANCE OF STORAGE

- A. CONTRACTOR shall periodically inspect stored products on a scheduled basis.
- B. CONTRACTOR shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that manufacturer required environmental conditions are maintained continually.
- C. CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.
- D. CONTRACTOR shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to ENGINEER when the equipment is installed.

1.07 INSTALLATION REQUIREMENTS

- A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.
- B. After installation, CONTRACTOR shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.
- C. CONTRACTOR shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment until completion and final acceptance of the Work by OWNER. Damaged material and equipment shall be immediately removed from the Site.

1.08 EQUIPMENT WARRANTIES

- A. Warranties shall be nonprorated, include all parts and labor, and be in written form. Warranties shall specifically exclude buyer's indemnification language. Warranty language shall not eliminate manufacturer's responsibility for sizing of the equipment. During warranty period, manufacturer shall be responsible for any travel expenses, outside contractor fees, and rental equipment fees associated with providing warranty service. Manufacturer shall pay expenses incurred for repairs and parts replacement not made by manufacturer if manufacturer's response is not within 72 hours of notification by OWNER. Warranty language shall be provided with the shop drawings.

1.09 CONCRETE EQUIPMENT BASE

- A. Cast-in-place concrete equipment bases shall be provided for all new and relocated equipment including electrical control panels, motor control centers, switchgear, etc. Concrete equipment bases shall be provided by CONTRACTOR except where specifically noted to be provided by others. Bases shall be 3 1/2-inch minimum height and shall be a minimum of 3 inches larger than equipment being supported. Grouting of equipment bases shall be as recommended by equipment manufacturer.
- B. Concrete and grout shall meet applicable sections of the specifications.
- C. Provide all anchor bolts, metal shapes and templates to be cast in concrete or used to form concrete for support of equipment.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 73 29

CUTTING, PATCHING, AND ALTERATIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: CONTRACTOR shall be responsible for all cutting, fitting, patching, and other alterations required to complete the Work as specified herein or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to install improperly sequenced Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 5. Remove samples of installed Work as specified for testing.
 - 6. Provide penetrations of surfaces for installation of piping and electrical conduit.

1.02 REFERENCES

- A. ANSI A10 Safety Requirements for Construction and Demolition.

1.03 QUALITY ASSURANCE

- A. CONTRACTOR shall perform all cutting, patching, and alterations in strict accordance with pertinent requirements of these Specifications.
- B. Except as modified by governing codes, CONTRACTOR shall comply with the applicable provision and recommendations of ANSI A10.

1.04 SUBMITTALS

- A. CONTRACTOR shall submit a written request to OWNER well in advance of executing any cutting or alteration which affects the following:
 - 1. Work of OWNER or any separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. The request shall include:
 - 1. Description of affected work.
 - 2. The necessity for cutting, patching, or alteration.
 - 3. Effect on work of OWNER, any separate contractor, or on the structural or weather-proof integrity of the Project.
 - 4. Description of proposed work to include:
 - a. Scope of cutting, patching, or alteration.
 - b. Trades who will execute the Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 5. Alternatives to cutting and patching.
 - 6. Written permission of any separate contractor whose work will be affected.

- C. Submit written notice to OWNER designating the date and the time the Work will be uncovered or executed.

1.05 SCHEDULING AND COORDINATION

- A. All work under this section shall be coordinated with OWNER's work forces and those of other contractors and shall be accomplished at times acceptable to OWNER.
- B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building, notify ENGINEER and OWNER 72 hours in advance and obtain OWNER's approval before proceeding with this phase of the Work. Temporary facilities, if required, shall be in place prior to disruption of service.

PART 2-PRODUCTS

2.01 NEW MATERIALS

- A. For replacement of work removed, CONTRACTOR shall use materials which comply with the pertinent sections of these Specifications.

2.02 SALVAGEABLE MATERIAL-NOT USED

2.03 UNSALVAGEABLE MATERIALS

- A. Materials or items demolished and not designated to become the property of OWNER or not designated to be reinstalled shall become the property of CONTRACTOR and shall be removed from the site and legally and properly disposed of by CONTRACTOR.
- B. Materials shall be removed by CONTRACTOR in a manner that will avoid damage to materials or equipment to remain.

PART 3-EXECUTION

3.01 INSPECTION

- A. CONTRACTOR shall inspect existing conditions including elements subject to movement or damage during cutting, patching, and other alterations.
- B. After uncovering the Work, CONTRACTOR shall inspect conditions affecting installation of new products or performance of new work.
- C. CONTRACTOR shall report unsatisfactory or questionable conditions to ENGINEER in writing.
- D. CONTRACTOR shall not proceed with work until unsatisfactory or questionable conditions are resolved.
- E. Beginning of cutting, patching, and alterations work means acceptance of existing conditions by CONTRACTOR.

3.02 PREPARATION AND PROTECTION

- A. CONTRACTOR shall provide temporary bracing, shoring, needling, and support of the structure during alterations work as necessary to prevent collapse, settling, or deflection and to protect persons and property from injury or damage.
- B. Temporary supports must adequately carry all existing and imposed load.
- C. CONTRACTOR shall provide and maintain temporary protection of surface finishes, equipment, and adjacent work designated to remain where demolition, removal, and new work is being done, connections are being made, materials are being handled, or equipment is being removed.
- D. CONTRACTOR shall provide temporary partitions or barriers to contain all dust, dirt, and debris from entering into finished areas or areas where OWNER is operating or storing products.
- E. CONTRACTOR shall provide adequate fire protection in accordance with local Fire Department requirements.
- F. CONTRACTOR shall provide waterproofing, weather protection, heat, and other facilities for that portion of the Work which may be exposed by cutting and patching, demolition, or other alterations.

3.03 PERFORMANCE

- A. CONTRACTOR shall accomplish all work of cutting, removal, demolition, patching, or other alterations using only persons skilled in the appropriate trade.
- B. CONTRACTOR shall execute the Work in a careful and orderly manner.
- C. CONTRACTOR shall execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- D. CONTRACTOR shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- E. CONTRACTOR shall fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. CONTRACTOR shall thoroughly clean and prepare all surfaces to receive new finish or covering to completely remove all dirt, dust, grease, oil, paint, loose materials, and soil.
- G. CONTRACTOR shall refinish entire surface as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

3.04 DEMOLITION, CUTTING, AND REMOVAL

- A. Cutting and removal of construction shall be performed by CONTRACTOR so as not to cut or remove more than is necessary and so as not to damage adjacent work.

- B. CONTRACTOR shall cut out embedded anchorages and attachment items as required to properly provide for patching and repair of the respective finishes.
- C. CONTRACTOR shall not cut structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
- D. CONTRACTOR shall not cut operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance.
- E. CONTRACTOR shall not cut work exposed to view (exterior or interior) in a manner resulting in noticeable reduction of visual qualities as determined by OWNER.
- F. Construction that is to remain which is loosened, cracked, or otherwise damaged or defaced as a result of careless cutting or demolition and is unsuitable for use intended shall be removed and replaced at no additional cost to OWNER.
- G. CONTRACTOR shall clean demolished areas and remove debris, waste, and rubbish from the building at the conclusion of each day's work.
- H. CONTRACTOR shall not let piled waste material endanger the structure.

3.05 PATCHING, EXTENDING, AND MATCHING

- A. Patching work shall conform to the standards of the Specifications where applicable, and where not specified, work shall conform to the highest standards of the applicable trade.
- B. CONTRACTOR shall patch construction to match adjacent work unless noted otherwise.
- C. Patching or restoration shall be carried to natural breaks (e.g., corners) wherever possible.
- D. CONTRACTOR shall provide adequate support to substrate for patching finishes.
- E. Transitions: CONTRACTOR shall restore existing work that is damaged during patching operations to a condition equal to its construction at the time of the start of the Work.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.
 - 5. Warranties.

1.02 CLOSEOUT PROCEDURES

- A. CONTRACTOR shall provide submittals to ENGINEER that are required by governing or other authorities.
- B. CONTRACTOR shall comply with General Conditions and Supplementary Conditions and complete the following before requesting ENGINEER's observation of the Work or designated portion thereof for substantial completion.
 - 1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, and similar required documentation for specific units of Work, enabling OWNER's unrestricted occupancy and use.
 - 2. Submit record documentation, maintenance manuals, tools, spare parts, keys, and similar operational items.
 - 3. Submit consent of surety (if surety required in Contract).
 - 4. Complete final cleaning, touch-up work of marred surfaces, and remove temporary facilities and tools.

1.03 FINAL CLEANING

- A. It is CONTRACTOR's responsibility to completely clean up the construction site at the completion of the Work.
- B. CONTRACTOR shall clean areas of the building in which painting and finishing work is to be performed just prior to the start of this work and maintain these areas in satisfactory condition for painting and finishing. This cleaning includes:
 - 1. Removal of trash and rubbish from these areas.
 - 2. Broom cleaning of floors.
 - 3. Removal of any plaster, mortar, dust, and other extraneous materials from finish surfaces, including but not limited to exposed structural steel, miscellaneous metal, masonry, concrete, mechanical equipment, piping, and electrical equipment.
- C. In addition to the cleaning specified above and the more specific cleaning that may be required in various technical sections of the Specifications, CONTRACTOR shall prepare the Project for occupancy by a thorough cleaning throughout, which shall include the following:

1. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
2. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
3. Replace filters of operating equipment.
4. Clean debris from roofs, gutters, downspouts, and drainage systems.
5. Clean site; sweep paved areas, rake clean landscaped surfaces.
6. Remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.04 ADJUSTING

- A. CONTRACTOR shall adjust operating products and equipment to provide smooth and unhindered operation.

1.05 PROJECT RECORD DOCUMENTS

- A. CONTRACTOR shall maintain on Site one set of the following record documents to record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. CONTRACTOR shall make entries that are complete and accurate, enabling future reference by OWNER.
- C. CONTRACTOR shall store record documents separate from documents used for construction.
- D. CONTRACTOR shall record information concurrent with construction progress.
- E. Specifications: CONTRACTOR shall legibly mark and record at each Product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by addenda and modifications.
- F. Record Drawings: CONTRACTOR shall legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.

1.06 WARRANTIES

- A. CONTRACTOR shall provide warranties beyond project one-year warranty as required by technical sections.
- B. Submit warranty information as follows:
 - 1. Provide original copies bearing authorized signatures.
 - 2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers, and provide Table of Contents and assemble in three-ring binder with durable cover.
 - 3. Submit with request for certificate of Substantial Completion.
 - 4. For items of work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance listing date of acceptance as start of warranty period.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 03 11 00
CONCRETE FORMWORK

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Forms for cast-in-place concrete.
 - 2. Form accessories.
 - 3. Openings for other work.
 - 4. Form stripping.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ACI 117–Tolerances for Concrete Construction.
- B. ACI 301–Structural Concrete for Buildings.
- C. ACI 318–Building Code Requirements for Reinforced Concrete.
- D. ACI 347–Recommended Practice for Concrete Formwork.
- E. PS1–Construction and Industrial Plywood.

1.03 DESIGN

- A. All formwork shall comply with ACI 347 and ACI 301.
- B. CONTRACTOR shall assume the responsibility for the complete design and construction of the formwork.

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 00–Submittals for form ties, form coatings, form liners (if any), and any other form accessories.
- B. Submit geometry of forms for circular structures.

1.05 MEASUREMENT AND PAYMENT

- A. Concrete formwork will be incidental to the installation of concrete structures, foundations, pavements, etc.

PART 2–PRODUCTS

2.01 FORMS

- A. Forms shall be of wood, plywood, steel, fiberboard lined, or other approved materials which will produce concrete which meets the specified requirements. The type, size, quality, and shape of all materials of which the forms are made are subject to the review of ENGINEER.
- B. Caution shall be exercised in the use of wood or composition forms or form liner to be certain that no chemical reaction will take place which causes a damaging effect on the concrete surface.

2.02 FORM TIES–NONREMOVABLE

- A. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the tie shall be adjustable in length. Ties shall have cones on the water side of water-containing structures. Ties shall also have cones on the exterior side of all structures which have PVC water-stopped construction joints. Ties shall provide a positive disconnection on both ends 1 to 1 1/2 inches inside the finished face of the concrete.
- B. All wall ties used in the placement of structures which have PVC or hydrophilic water-stopped construction joints shall contain integral waterstops. All such ties shall be crimped or deformed in such a manner that the bond between concrete and tie cannot be broken in removal of the outer units. This portion of the tie shall not be removed prior to 24 hours after completion of the concrete placement.
- C. The use of wood spacers and wire ties will not be approved.

2.03 FORM TIES–REMOVABLE

- A. Taper ties which are designed to be removed entirely from the wall may be used with forms designed for this tie type and spacing.
- B. Tie holes shall be plugged with either a neoprene plug, Sure-Plug by Dayton Superior, Inc., or an EPDM rubber plug, X-Plug by Sika Greenstreak, or equal.
- C. Cementitious waterproofing material for patching taper tie holes shall be Hey Di K-11, Xypex Patch-N-Plug, or equal. Taper tie holes above the normal operating water surface shall be patched with mortar mix as specified in Section 03 30 00–Cast-In-Place Concrete for patching tie holes.

2.04 FORM COATINGS

- A. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

2.05 CHAMFER STRIPS

- A. Provide 3/4-inch by 3/4-inch wood or plastic chamfer strips at all exposed corners, except as noted.

2.06 KEYWAYS

- A. Keyways shall be formed with wood inserts.

PART 3—EXECUTION

3.01 CONSTRUCTION

- A. Forms shall conform to the shape, line, grade, and dimensions as shown on the drawings. They shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports and shall support the loads and pressures without deflection from the prescribed lines. They shall be properly braced or tied together so as to maintain position and shape. Spacing of ties shall be recommended by the tie manufacturer.
- B. Formwork and finished concrete construction shall meet the tolerances specified in ACI 117.
- C. All exposed curved surfaces shall be formed to the continuous surface of the radius specified. Where segmented forms are proposed, a form system which deviates more than 3/8 inches from a circle through pan edges will not be allowed.
- D. Architectural surfaces and surfaces to be fitted with equipment shall be formed to match the shape intended. Where indicated on the drawings, the form shall be lined with minimum 3/8-inch masonite and shimmed as required.
- E. When forms are placed for successive concrete placement, thoroughly clean concrete surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.
- F. At the request of ENGINEER, temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before depositing concrete.
- G. Provide inserts and provide openings in concrete form work to accommodate work of other trades. Verify size and location of openings, recesses, and chases with the trade requiring such items. Securely support items to be built into forms.
- H. Provide top forms for inclined surfaces where the slope is too steep to place and vibrate concrete.
- I. Bevel wood inserts for forming keyways (except in expansion joints where inserts shall have square edges), reglets, recesses, and the like to allow for ease of removal. Inserts shall be securely held in place prior to concrete placement. Unless otherwise shown, chamfer strips shall be placed in the angles of the forms to provide 3/4-inch bevels at exterior edges and corners of all exposed concrete.
- J. The forms shall be oiled with a field-applied commercial form oil or a factory-applied nonabsorptive liner. Oil shall not stain or impede the wetting of surfaces to be cured with water or curing compounds. The forms shall be coated prior to placing reinforcing steel. Oil on reinforcement will not be permitted.

- K. All form surfaces shall be thoroughly cleaned, patched, and repaired before reusing and are subject to review of ENGINEER.

3.02 FORM REMOVAL

- A. Supporting forms and shoring shall not be removed until the member has acquired sufficient strength to support its own weight and the construction live loads on it.
- B. All form removal shall be accomplished in such a manner that will prevent injury to the concrete.
- C. Forms shall not be removed before the expiration of the minimum times as stated below or until the concrete has attained its minimum 28-day design strength as confirmed by concrete cylinder tests, unless specifically authorized by ENGINEER.
 - 1. Wall and vertical faces: 24 hours.
 - 2. Columns: 24 hours.
 - 3. Beams and elevated slabs: 14 days.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes providing complete, in-place, all steel and fibers required for reinforcement of cast-in-place concrete as shown on the drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. Applicable standards listed in this section include, but are not necessarily limited to the following:
 - 1. ACI 315—Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 2. ACI 318—Building Code Requirements for Reinforced Concrete.
 - 3. ASTM A1064—Standard Specifications for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 4. ASTM A615—Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A996—Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcing.
 - 6. ASTM C1116—Standard Specification for Fiber-Reinforced Concrete.
 - 7. CRSI—Manual of Standard Practice.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 33 00—Submittals.
- B. Provide complete shop drawings of all material to be furnished and installed under this section:
 - 1. Before fabrication of the reinforcement is begun, CONTRACTOR shall obtain the approval of ENGINEER on reinforcing bar lists and placing drawings.
 - 2. These drawings and lists shall show in detail the number, size, length, bending, and arrangement of the reinforcing. Reinforcing supports shall also be located on the shop drawings.
 - 3. Shop drawings shall be in accordance with ACI 315.

1.04 PRODUCT HANDLING

- A. Delivery:
 - 1. Deliver reinforcement to the job site bundled, tagged, and marked.
 - 2. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

- B. Storage: Store reinforcement at the job site on blocks and in a manner to prevent damage and accumulation of dirt and excessive rust.

1.05 MEASUREMENT AND PAYMENT

- A. Concrete reinforcement will be incidental to the installation of concrete structures, foundations, pavements, etc.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Reinforcing bars shall comply with ASTM A615 or A996 Type R, Grade 60. Reinforcing bars required to be welded shall be ASTM A706 low alloy.
- B. Steel wire and welded wire fabric shall comply with ASTM A1064. Fabric shall be provided in flat sheets. Rolled fabric shall not be used.
- C. Reinforcement supports including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be:
 - 1. Wire bar-type supports complying with CRSI recommendations, unless otherwise indicated.
 - 2. For slabs on grade, supports with sand plates, or horizontal runners where base material will not support chair legs.
 - 3. For exposed-to-view concrete surfaces or where the concrete surface will be exposed to weather or moisture, where legs of supports are in contact with forms, supports with either hot-dipped galvanized or plastic protected legs.
 - 4. When supports bear directly on the ground and it is not practical to use steel bar supports, precast concrete blocks may be used to support only the bottom lift of reinforcement. The precast blocks must be solid, be of an equal or higher strength than the concrete being placed, must provide adequate support to the reinforcement, and be of proper height to provide specified reinforcing cover. The use of face bricks, hollow concrete blocks, rocks, wood blocks, or other unapproved objects will not be permitted.
- D. Fibrous Reinforcing:
 - 1. Fibrous concrete reinforcement shall be Fibermesh 300, manufactured by Propex Concrete Systems, or equal.
 - 2. Reinforcement shall be 100% virgin polypropylene fibrillated, multi-length graded fiber containing no reprocessed olefin materials and specifically manufactured for use as concrete secondary reinforcement.
 - 3. Physical Characteristics:
 - a. Specific Gravity: 0.91.
 - b. Fiber Length: Multidesign gradation.
- E. Mechanical Splices and Threaded Couplers:
 - 1. Mechanical splices shall be Zap Screwlok by Bar Splice Products, Inc., or equal.
 - 2. Threaded couplers and dowel bar replacements shall be Dowel Bar Splicer System by Dayton/Richmond, or equal.
 - 3. Mechanical splices and couplers shall be capable of developing at least 125% of the yield strength of the reinforcing bar.

2.02 FABRICATION

- A. General:
 - 1. Fabricate reinforcing bars to conform to required shapes and dimensions with fabrication tolerances which comply with CRSI Manual.
 - 2. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
 - 3. Unless otherwise shown on the drawings, all end hook dimensions shall conform with "ACI Standard Hooks."
- B. Reinforcement with any of the following defects shall be deemed unacceptable and will not be permitted in the work:
 - 1. Bar lengths, depths, and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on drawings or final shop drawings.
 - 3. Bar with reduced cross section because of excessive rusting or other cause.

PART 3-EXECUTION

3.01 INSPECTION

- A. Examine the substrate, formwork, and the conditions under which concrete reinforcement is to be placed.
- B. Correct conditions detrimental to the proper and timely completion of the work.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 - 1. Comply with the specified standards for details and methods of placing reinforcement and supports.
 - 2. Clean reinforcement to remove loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete.
- B. Placing Reinforcement:
 - 1. All reinforcing shall be placed in accordance with Contract drawings and with shop drawings stamped and approved by ENGINEER.
 - 2. Position, support, and secure reinforcing against displacement by formwork, construction, or concrete placement operations.
 - 3. Support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as needed.
 - 4. Unless otherwise shown on the drawings, the reinforcement is to be so detailed and placed as to allow the following concrete protection:
 - a. Three inches of cover where the concrete is placed directly against ground.
 - b. Two inches of cover where the concrete is placed in forms but is to be exposed to weather, liquid, or the ground.
 - c. One-inch cover in slabs and walls not exposed to weather, liquid, or the ground.

- d. One and one-half-inch cover in beams, girders, and columns not exposed to weather, liquid, or the ground. This cover applies to beam stirrups and column ties where applicable.
 5. Reinforcement shall be positioned within $\pm 3/8$ -inch for members with depth to tension reinforcing from compression face less than or equal to 8 inches. Tolerance shall be $\pm 1/2$ -inch for members with depth to tension reinforcing from compression face greater than 8 inches. Tolerance on dimension between adjacent bars in slab and wall reinforcing mats shall be 1-inch. Secure against displacement by anchoring at the supports and bar intersections with wire or clips.
 6. Bars shall be securely tied at all intersections except where spacing is less than 1-foot in each direction when alternate intersections shall be tied. To avoid interference with embedded items, bar spacing may be varied slightly if acceptable to ENGINEER. Tack welding of reinforcing will not be permitted.
 7. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 8. If reinforcing must be cut because of openings or embedded items in the concrete, additional reinforcing must be provided adjacent to the opening at least equal in cross sectional area to that reinforcing which was cut, and it shall extend a minimum of 36 bars diameters beyond the opening on each side or as shown on the drawings. At sumps or depressions in slabs, bars shall be bent and/or extended under sumps or depressions.
 9. Wall reinforcing mats shall be secured in a vertical plane by providing clearance from forms with bar supports and by using Z-shaped bars at ± 4 feet on center wired between two mats of steel, spacing and staying both of them. Nails shall not be driven into the forms to support reinforcement and neither shall wire for this purpose come in contact with the forms. Alternate top transverse bars in slab shall be supported by individual bar chairs at approximately 3-foot 0-inch centers. Bottom longitudinal bars shall be supported by continuous bar chairs at approximately 4-foot 0-inch centers.
 10. If carrier bars are to be used, CONTRACTOR shall provide reinforcing bars for this purpose in addition to the reinforcing called for by the drawings and specifications.
- C. Reinforcement Supports:
1. Strength and number of supports shall be sufficient to carry reinforcement.
 2. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support.
 3. Do not use supports as bases for runways for concrete-conveying equipment and similar construction loads.
- D. Welded Wire Fabric:
1. Install welded wire fabric in as long of lengths as practicable.
 2. Lap adjoining pieces at least one full mesh.
 3. Fabric shall be supported with bar supports.
- E. Splices:
1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying.
 2. Lap splices in reinforcing shall be provided as shown on the drawings. Where lap splice lengths are not shown on the drawings, provide Class B, Category 1 lap splices in accordance with ACI 318.
 3. Adjacent splices of tangential bars in circular slabs and horizontal bars in circular walls shall be staggered a minimum of one full lap splice length or 3 feet, whichever is greater, unless otherwise shown. Stagger dimension shall be measured from center to center of lap splices.

4. For circular walls, horizontal bar lap splices shall not coincide in vertical arrays more frequently than every third bar.
 5. Mechanical splices and threaded dowel bar inserts may be used where approved by ENGINEER.
- F. Embedded Items:
1. Allow other trades to install embedded items as necessary.
 2. Particularly after bottom layer of reinforcing is placed in slabs, allow electrical contractors to install conduit scheduled for encasement in slabs prior to placing upper layer of reinforcing.
- G. Minimum Reinforcing: Where reinforcing is not shown, provide a minimum of No. 4 at 8-inch centers each way in members 10 inches or less in thickness and No. 5 at 12-inch centers each way in each face in members greater than 10 inches thick.
- H. Fibrous Reinforcing:
1. Fibrous concrete reinforcing shall be used in all building interior slab-on-grade concrete and all precast concrete topping, and where shown on the drawings.
 2. Add fibers at a minimum rate of 1.5 pounds per cubic yard.
 3. Mix concrete in strict accordance with reinforcement manufacturer's recommendations.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All cast-in-place concrete as shown except as noted otherwise.
 - 2. PVC and hydrophilic waterstops, expansion joint fillers, bonding agents, patching mortars, curing compounds, nonshrink grout, grout topping, floor sealer, and other related items and accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ACI 211.1—Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 301—Specifications for Structural Concrete.
- C. ACI 304R—Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- D. ACI 305R—Guide to Hot Weather Concreting.
- E. ACI 306R—Guide to Cold Weather Concreting.
- F. ACI 308—Specification for Curing Concrete.
- G. ACI 309—Guide for Consolidation of Concrete.
- H. ACI 318—Building Code Requirements for Structural Concrete and Commentary.
- I. ASTM C31—Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- J. ASTM C33—Standard Specification for Concrete Aggregates.
- K. ASTM C39—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- L. ASTM C40—Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
- M. ASTM C88—Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- N. ASTM C94—Standard Specification for Ready-Mixed Concrete.
- O. ASTM C143—Standard Test Method for Slump of Hydraulic-Cement Concrete.

- P. ASTM C150—Standard Specification for Portland Cement.
- Q. ASTM C156—Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
- R. ASTM C172—Standard Practice for Sampling Freshly Mixed Concrete.
- S. ASTM C231—Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- T. ASTM C260—Standard Specification for Air-Entraining Admixtures for Concrete.
- U. ASTM C309—Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- V. ASTM C494—Standard Specification for Chemical Admixtures for Concrete.
- W. ASTM C618—Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- X. ASTM C652—Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- Y. ASTM D994—Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- Z. ASTM D1752—Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 00—Submittals.
- B. Submit the following information:
 - 1. Gradation of fine and coarse aggregate—ASTM C33.
 - 2. Specific gravity and dry rodded density of each aggregate.
 - 3. Test of deleterious substances in fine and coarse aggregate—ASTM C33.
 - 4. Design mix of each individual concrete mix to be used.
 - 5. Previous test results or trial batch results with 7- and 28-day compressive strengths for each concrete mix proposed.
 - 6. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
 - 7. Brand, type, principal ingredient, and amount of each admixture to be used.
- C. It is important that the above data be submitted to ENGINEER well in advance of anticipated concreting operations to avoid any delay in construction.

1.04 MEASUREMENT AND PAYMENT

- A. Concrete slabs, driveways, and road pavement will be paid on a square yard basis in accordance with the bid form. Concrete curb will be paid for on a linear foot basis.

PART 2-PRODUCTS

2.01 CEMENT

- A. Cement shall be Portland cement conforming to ASTM C150. Cement used for structures exposed to wastewater, sludge, combined sewage, or sanitary sewage shall be Type II or Type I/II. All other cement shall be Type I or Type I/II. Type III cement shall be used only when permitted by ENGINEER. All cement shall be the product of one reputable manufacturer and mill.
- B. Cement shall be stored in a dry, weathertight, properly ventilated structure with the floor raised not less than 1 foot above the ground.

2.02 FLY ASH

- A. All fly ash used as an admixture in Portland cement concrete shall be Class C or F conforming to the requirements of ASTM C618.

2.03 AGGREGATE

- A. All aggregates shall be washed and shall consist of natural sand, gravel, or crushed rock and shall have clean, hard, durable, uncoated grains of strong minerals. The amounts of deleterious substances present in the fine and coarse aggregate expressed in percentages by weight shall not exceed the following:

Deleterious Substance	Aggregate	
	Fine	Coarse
Clay Lumps and Friable Particles	3.0	3.0
Coal and Lignite	0.5	0.5
Mineral finer than No. 200 sieve	3.0	
Soft Fragments	3.0	3.0
Chert*	---	5.0
Sum of Chert and Clay Lumps		5.0

* Material classified as chert and having a bulk specific gravity of less than 2.45. The percentage of chert shall be determined on the basis of the weight of chert in the sample retained on a 3/8-inch sieve divided by the weight of the total sample.

- B. The combined amount of all deleterious substances in an aggregate shall not exceed 5% of the weight of the aggregate.
- C. If requested by ENGINEER, sodium sulfate soundness tests (ASTM C88) shall be performed on the aggregate. When the aggregate is subjected to 5 cycles, the weight loss shall not exceed 12%. Samples of proposed aggregates shall be submitted to an independent laboratory for testing in advance of concrete work. All testing shall be performed in accordance with ASTM C33. Certified test results shall be submitted to ENGINEER confirming that aggregate complies with all stated specifications. Report shall identify source of aggregate and absorbed water.

- D. Fine aggregate shall be well-graded from coarse to fine and shall conform to the following requirements:

Percentage by Weight	
Passing 3/8-inch sieve	100
Passing No. 4 sieve	95-100
Passing No. 8 sieve	80-100
Passing No. 16 sieve	50-85
Passing No. 30 sieve	25-60
Passing No. 50 sieve	5-30
Passing No. 100 sieve	0-10

- E. Gradation of fine aggregate shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. The fineness modulus shall be not less than 2.3 or more than 3.1, nor shall the fineness modulus of any sample vary by more than +0.20 from the fineness modulus of the representative sample used in proportioning the concrete.
- F. If requested by ENGINEER, fine aggregate shall be subjected to the color-metric test for organic impurities (ASTM C40) and shall not produce a color darker than Figure 1, unless they pass the mortar strength test. Aggregate producing color darker than Figure 2 shall not be used in any event.
- G. Coarse aggregate shall be well-graded from coarse to fine, and when tested by laboratory sieves having square openings, shall conform to the following requirements:

	Percentage by Weight Aggregate	
	3/4-inch Stone	1 1/2-inch Stone
Passing 2-inch sieve	---	100
Passing 1 1/2-inch sieve	---	90-100
Passing 1-inch sieve	100	20-55
Passing 3/4-inch sieve	90-100	0-15
Passing 3/8-inch sieve	20-55	0-5
Passing No. 4 sieve	0-10	---
Passing No. 8 sieve	0-5	---

- H. The 3/4-inch aggregate shall be used in concrete members no thinner than 4 inches and less than 10 inches thick. A blend of 3/4-inch and 1 1/2-inch aggregate shall be used in members 10 inches thick and thicker with the 3/4-inch aggregate comprising between 35% and 65% of the total coarse aggregate. When members thinner than 10 inches are placed monolithically with members thicker than 10 inches, the aggregate requirements for the thinner member shall apply.
- I. Aggregates must be allowed to drain for at least 12 hours before being used. The ground upon which aggregates are stored must be hard, firm, well-drained, and free from all vegetable matter. Various sizes of aggregates must be stored separately, and if they have become contaminated or merged with each other, they shall not be used.

2.04 WATER

- A. Water used in mixing concrete shall be clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious substances.

2.05 ADMIXTURES

- A. Water Reducing Admixture shall be Master Pozzolith® 200 by Master Builders Solutions, Daracem 19 by Grace, or equal. Water reducing admixture shall conform to ASTM C494, Type A and Type F. Water reducing admixture shall not reduce durability, shall increase strength 10%, and shall not affect bleeding characteristics over reference mix.
- B. Air-Entraining Admixture shall be equal to MasterAir® AE 90 by Master Builders Solutions, Darex by Grace Construction Products, or equal. Air-entraining admixture shall conform to ASTM C260.
- C. No other admixture will be allowed without written approval of ENGINEER. All admixture shall be compatible with cement, aggregate, and water used.

2.06 PROPORTIONING

- A. The proportions of aggregate to cement shall be such as to produce a workable mixture that can be thoroughly compacted and that will work readily in the forms and around reinforcement without permitting materials to segregate or excess water to collect on the surfaces. The combined aggregates shall be such that when separated on the No. 4 sieve, the weight passing the sieve shall not be less than 30% nor greater than 50%.
- B. Concrete of various classes shall have the following maximum water/cement or water/(cement + fly ash) ratio minimum compressive strengths at 28 days and minimum cement and fly ash contents:

Class	Maximum Water/ Cement or Water/ (Cement+Fly Ash)	Minimum 28 Day Strength-Pounds per Square Inch	Cement Content-Pounds per Cubic Yard	Fly Ash- Pounds per Cubic Yard	
				Type C	Type F
AA	0.42	4,500	611	---	---
A	0.45	4,000	564	---	---
A-FA	0.45	4,000	480	110	125
B	0.53	3,500	517	---	---
C	0.53	3,000	517	---	---
X	---	2,000	376	---	---

- C. Except as otherwise indicated on the drawings or specified, all concrete shall be Class A or Class A-FA concrete.
- D. Grout for clarifier bottoms shall contain pea gravel, crushed stone, or other suitable coarse aggregate graded from 1/8 inch to 3/8 inch in addition to well-graded sand. Use six bags of Portland cement and 100 pounds of Class C fly ash per cubic yard. Not more than 35 gallons of mixing water per cubic yard, including free water in aggregate, shall be used. Minimum

28-day design strength shall be 4,000 psi. Provide similar mix with fibrous reinforcing added for concrete topping over precast plank.

- E. All concrete mixes shall be designed for a strength of 15% above that specified to allow for job variations. All mixes shall be designed in accordance with ACI 211.1 by a competent concrete engineer or competent laboratory technician. Required materials test data shall be submitted with design mixes for review and approval by ENGINEER. Mix computations shall be submitted if requested by ENGINEER.
- F. The slump for all concrete shall be 3 inches and concrete with a slump within the range of 2 to 3 1/2 inches will be acceptable unless otherwise stated.
- G. A water-reducing admixture shall be used in all concrete. A qualified representative of the manufacturer shall be available to assist in proportioning the concrete, advise on the proper addition of the admixture to the concrete, and advise on adjustments of concrete proportions to suit job conditions.
- H. An air-entraining admixture shall be used in all concrete except as noted. Air content shall be tested by the pressure method as outlined in ASTM C231 and shall be between 4% to 7% by volume. An air-entraining admixture is not required for concrete patching and for concrete floors, equipment pads, and supports in interior heated buildings where the concrete will be protected from freezing during and after construction.
- I. CONTRACTOR shall submit to ENGINEER concrete cylinder compressive strength results from previous projects for the same concrete mixes proposed on the current project. If this information is not available, one cubic yard trial batches of each individual mix proposed for use shall be made prior to use in the work. Four test cylinders shall be made for each trial batch, two to be tested at 7 days and two at 28 days. The trial batches shall be made preceding actual placement operations so that the results of the 7-day tests can be obtained. All costs for material, equipment, and labor incurred during design of concrete mixes shall be borne by CONTRACTOR.
- J. All aggregates shall be measured by weight. The concrete mixer is to be equipped with an automatic water-measuring device that can be adjusted to deliver the desired amount of water.

2.07 WATERSTOPS

- A. PVC waterstops shall be as manufactured by Greenstreak, Inc., W.R. Meadows, Durajoint, or equal. Provide serrated center bulb-type, nontapered 3/8-inch minimum thickness waterstops manufactured from virgin polyvinyl chloride with no reclaimed/scrapped material or pigment whatsoever conforming to Corps of Engineers CRD-C-572. The waterstop shall have an integral fastening system consisting of hogrings or grommets. For 6-inch PVC waterstops in construction joints, use Greenstreak, Inc. Profile No. 732, or equal. For expansion joints, use Greenstreak, Inc. Profile No. 735, or equal. Where 4-inch PVC waterstops are called for in the drawings, use Greenstreak, Inc. Profile No. 702, or equal.
- B. Hydrophilic waterstop shall be a flexible hydrophilic natural rubber strip composed of nonvulcanized rubber and urethane polymer hydrophilic agent creating a moisture-activated, self-healing waterproofing compound.

- C. The hydrophilic waterstop shall be NSF Certified for potable water use (Adeka MC-2010MN).
- D. Hydrophilic waterstop shall be Adeka Ultraseal, or equal, products as follows:
 - 1. Construction Joints:
 - a. Wall/slab thickness greater than 9 inches with double mat of reinforcing: MC-2010MN (3/4 inch by 3/8 inch) with embedded stainless steel wire mesh for expansion control. The waterstop shall develop a minimum of 400 psi expansion pressure and withstand a minimum 150-foot hydrostatic head. Expansion amount shall not exceed 120%.
 - b. Wall/slab thickness between 4 inches and 9 inches with 1-inch minimum cover and single or double mat of reinforcing: KBA-1510FP (9/16 inch by 3/8 inch). Expansion amount shall not exceed 30%.
 - 2. Pipe Penetrations:
 - a. Wall/slab thickness between 4 inches and 9 inches and pipe diameter greater than 4 inches and less than or equal to 24 inches: KBA-1510FP (9/16 inch by 3/8 inch).
 - b. Wall/slab thickness greater than 9 inches and pipe diameter greater than 4 inches and less than or equal to 24 inches: MC-2005T (3/4 inches by 3/16 inches).
 - c. Wall/slab thickness greater than 9 inches and pipe diameter greater than 24 inches: MC-2010MN (3/4 inch by 3/8 inch) with embedded stainless steel wire mesh for expansion control.

2.08 JOINT FILLER

- A. Expansion joints shall have standard 1/2-inch-thick cork expansion joint filler, W. R. Meadows, or equal, meeting ASTM D1752–Type II. Exceptions to this are expansion joints in exterior concrete walks and between concrete walks and other structures which shall be asphalt expansion joint filler, 1/2-inch-thick, Grace, W.R. Meadows, or equal, meeting ASTM D994.

2.09 BONDING AGENT

- A. Acceptable manufacturers include MasterProtect® P 110 by Master Builders Solutions, MasterEmaco® P 124 by Master Builders Solutions, MasterEmaco® ADH 326 by Master Builders Solutions, or equal.

2.10 PATCHING ADDITIVE

- A. Acceptable manufacturers include MasterEmaco® A 660 by Master Builders Solutions, Sonocrete by Sonneborn Contech Co., or equal.

2.11 NONSHRINK GROUT

- A. Acceptable manufacturers include Dayton Superior, Master Builders Solutions, or equal. Grout shall be nonshrink, nonmetallic and shall achieve a strength of 7,500 psi in 28 days.

2.12 CURE–SEAL HARDENER

- A. Penetrating sealer for interior building floors shall be Ashford Formula by Curecrete Chemical Company, Inc., or equal. See finish schedule for locations to be used.

PART 3-EXECUTION

3.01 MIXING

- A. Ready-mixed concrete shall be batched, mixed, and delivered in accordance with ASTM C94 and ACI 304R. In general, concrete shall be mixed 50 revolutions at plant, 20 upon arrival at site, and 20 each time water is added; maximum of 110 revolutions at mixing speed. Concrete shall be delivered and discharged within 1 1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates or the cement to the aggregates. Truck mixers shall be equipped with drum revolution counters. In no event shall concrete which has taken its initial set be allowed to be used. Retempering of concrete is not permitted.
- B. A representative of ENGINEER may be at the batching plant periodically to observe the batching and mixing.
- C. No water shall be added on the job unless required by CONTRACTOR and with the knowledge of ENGINEER; the amount of water, if added, shall be recorded on all copies of the delivery tickets. If water is added, CONTRACTOR shall verify that the required water-cement ratio is not exceeded.
- D. Concrete shall have a temperature not less than 60°F nor more than 80°F as delivered to the jobsite.
- E. With each load of concrete, CONTRACTOR shall obtain delivery tickets and shall make these tickets available for review by ENGINEER. Delivery tickets shall provide the following information:
 - 1. Date.
 - 2. Name of ready-mix concrete plant, job location, and CONTRACTOR.
 - 3. Type of cement and admixtures, if any.
 - 4. Specified cement content in sacks per cubic yard of concrete and approved concrete mix number or designation.
 - 5. Amount of concrete in load, in cubic yards.
 - 6. Water-cement ratio.
 - 7. Water added at job, if any.
 - 8. Truck number and time dispatched.
 - 9. Number of mixing drum revolutions.
- F. For job-mixed concrete, all concrete materials shall be mixed in a machine batch mixer for at least 1 1/2 minutes after all ingredients are in the mixer and shall continue until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall not be loaded beyond the capacity given by the manufacturer and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device that will positively prevent discharging the mixture until the specified mixing time has elapsed.

3.02 JOINTS

- A. CONTRACTOR shall place all joints as shown on the drawings or specified herein. If acceptable to ENGINEER, CONTRACTOR may, at his own expense, place construction joints in addition to and at places other than those shown on the drawings. Unless otherwise shown, all joints shall be straight, truly vertical or horizontal, and proper methods shall be employed to obtain this result.

- B. Where construction joints are not shown on the drawings or specified elsewhere, CONTRACTOR shall provide construction joints in walls as follows:
 - 1. Vertical construction joints at 60 feet on center maximum but not more than 15 feet from corners or intersections.
 - 2. Horizontal construction joints at 18 feet on center maximum for walls 12 inches or more in thickness.
 - 3. Horizontal construction joints of 8 feet on center maximum for walls 10 inches or less in thickness.
- C. Immediately after completion of the first pour at a joint, the concrete surface, reinforcement, and waterstop projecting beyond the joint shall be thoroughly cleaned and laitance removed. The waterstops shall not be disturbed after the concrete in the first pour at a joint has set. Concrete around waterstops shall be thoroughly compacted by hand spading and vibrating. Immediately before the second pour, all extraneous matter shall be removed from the joint, the waterstop and steel cleaned, and the surface thoroughly wetted.
- D. Concrete at all joints shall have been in place at least 48 hours before abutting concrete is placed. At least two hours must elapse after depositing concrete in columns or walls before depositing in beams, girders, or slab supported thereon. Beams, girders, brackets, column capital, and haunches shall be considered as part of the floor system and shall be placed integrally therewith.

3.03 WATERSTOPS

- A. Unless noted otherwise, PVC waterstops shall be provided at all expansion joints and at construction joints in floors and walls of structures exposed to ground or liquid on one side and occupied by personnel or nonsubmerged equipment on the other side.
- B. PVC waterstops shall be made continuous by splicing. Waterstops shall be spliced using a corner, tee, or cross splice, as applicable, at intersections. Waterstops shall be mitered to maintain the continuity of the ribs and center bulb. Splices shall be made using a hot metal plate or an electric splicer and full butt weld. Direct flame will not be allowed. Sample field-splices shall be submitted to ENGINEER for review prior to construction.
- C. PVC waterstops placed in all joints shall be securely held in place by an acceptable method or as shown on the drawings. PVC waterstops shall be installed and secured prior to concrete placement. PVC waterstops shall not be inserted into wet concrete. No nails will be permitted through the waterstop. Great care shall be taken when concrete is placed so that the waterstop remains erect and is not bent over.
- D. Either hydrophilic or PVC waterstop shall be provided at all construction joints in liquid holding tanks and channels that are not adjacent to areas occupied by personnel and at joints between new and existing concrete. Waterstop shall be placed as shown on drawing details, if any, and in accordance with the manufacturer's recommendations.

3.04 BONDING TO EXISTING CONCRETE

- A. When placing new concrete adjacent to existing concrete, the existing concrete shall be thoroughly roughened, cleaned, and saturated with water 24 hours before pouring new concrete. Existing concrete is defined as concrete more than six months old. At time of new pour, remove any standing water and apply bonding agent. Bonding agent shall be applied in accordance with manufacturer's recommendations.

3.05 PATCHING EXISTING CONCRETE

- A. When patching existing concrete, remove poor concrete until firm hard concrete is exposed; roughen and clean surface of the existing concrete, clean any exposed reinforcing bars, and pour new concrete. Concrete finish shall match existing concrete. New concrete shall be 4,000 psi 28-day strength mixed with patching additive, mixed according to manufacturer's instructions. Concrete shall not be air-entrained.

3.06 EMBEDDED ITEMS IN CONCRETE

- A. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.
- B. All contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
- C. Embedded items shall be positioned accurately and supported against displacement. Reinforcing bars shall clear embedded items a minimum of 2 inches.

3.07 PLACING CONCRETE

- A. Before placing concrete, all equipment, forms, ground, reinforcements, and other surfaces with which the concrete will come in contact are to be thoroughly cleaned of all debris, ice, and water. Ground shall be wetted prior to placement of concrete on it.
- B. After reinforcement is placed and before concrete is placed over it, ENGINEER shall be allowed sufficient time to observe the reinforcing.
- C. Unless otherwise authorized by ENGINEER, all concrete shall be placed in the presence of ENGINEER.
- D. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods that will prevent the segregation or loss of materials. Chuting for conveying purposes must be accomplished in such a manner as to prevent segregation or loss of materials. Receiving hoppers shall be installed at the chute discharge and at no point in its travel from the mixer to place of final deposit shall the concrete pass through a free vertical drop of more than 3 feet. Elephant trunks or tremies shall be used in all wall pours to prevent coating of forms and reinforcing bars.
- E. Care shall be taken to avoid an excess of water on the concrete surface. Excess water shall be drained or otherwise removed from the surface. Dry cement or a mixture of cement and sand shall not be sprinkled directly on the surface to absorb water.
- F. Concrete in wall and beam pours shall be deposited in approximately horizontal layers not to exceed 18 inches in thickness. Each layer shall be well worked into the preceding layer while both layers are still soft.
- G. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation from rehandling or flowing. The maximum allowable lateral movement of the concrete after being deposited is 3 feet. Once concreting is started, it shall be carried on as a continuous operation until the placing of the section or panel is completed.

- H. All concrete shall be placed with the aid of mechanical vibrating equipment in accordance with ACI 309. In congested areas, vibration shall be supplemented by hand spading adjacent to the forms. Vibration should secure the desired results within 5 to 15 seconds at intervals of 18 inches apart maximum. The vibrator shall penetrate the preceding layer of concrete. Vibrators shall have a frequency of not less than 10,000 impulses per minute when in operation submerged in concrete.
- I. A sufficient number of spare vibrators shall be kept in ready reserve to provide adequate vibration in case of breakdown of those in use.
- J. In placing concrete in beams where it is intended to be continuous and monolithic with the slab above, a delay to provide for settlement of the deep concrete shall be scheduled before placing the upper concrete in the slab. The length of delay shall be as long as possible and still permit the revibration of the deep concrete.
- K. Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require excavating approximately 12 inches below the bottom of the concrete surface and refilling with gravel and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until 24 hours after the concrete pour has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.
- L. No extra payment will be allowed for dewatering, undercutting, and gravel fill.

3.08 MOIST CURING

- A. All concrete shall be maintained in a moist condition for at least 7 days after being deposited except that for high-early strength concrete, a 3-day period will be sufficient. Moist curing shall be accomplished by one of the following methods:
 - 1. Wood forms left in place and kept wet at all times. If wood forms are not going to be kept wet or if metal forms are used, they shall be removed as soon as practicable and other methods of moist curing shall be started without delay.
 - 2. Use of a curing compound conforming to ASTM C309, Type I as approved by ENGINEER. Curing compound shall be applied at a uniform rate as indicated by the manufacturer sufficient to comply with the requirements of the test water retention of ASTM C156. Curing compound applied to vertical concrete surfaces after forms are removed shall be specially adapted to provide required coverage on the vertical surface. On nonformed surfaces, the curing compound shall be applied immediately after the disappearance of the water sheen after finishing of the concrete. Curing compound shall not be used on concrete surfaces that are to be painted, receive ceramic tile or resilient flooring, or be waterproofed. Care shall be taken not to get curing compound on construction joints, reinforcing steel, and other surfaces against which new concrete will be poured.
 - 3. Use of plastic film. Plastic film shall have a minimum thickness of 4 mils. It shall be placed over the wet surface of the fresh concrete as soon as possible without marring the surface and shall be weighted so that it remains in contact with all exposed surfaces of the concrete. All joints and edges shall be lapped and weighted. Any tears in the film shall be immediately repaired.
 - 4. Application of wet coverings weighing 9 ounces per square yard such as burlap, cotton mats, or other moisture-retaining fabrics. The covering system shall include two layers and shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.
 - 5. Use of an approved waterproof curing paper. Edges of adjacent sheets shall be overlapped several inches and tightly sealed.

6. Ponding of water or continuous sprinkling of water is permitted. Sprinkling at intervals will not be permitted.
 7. Construction joints shall be moist cured by one of the methods listed above except by Method "2."
- B. The use of moist earth, sand, hay, or another method that may discolor hardened concrete will not be permitted.

3.09 HOT WEATHER CONCRETING

- A. When the atmospheric temperature exceeds 80°F during concrete placement, this section and ACI 305 shall apply in addition to all other sections of the specifications.
- B. The temperature of the delivered concrete shall not exceed 95°F.
- C. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched so as to avoid delay in concrete placement, and the work shall be organized to use the concrete promptly after arrival at the jobsite.
- D. The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.
- E. If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.
- F. Exposed concrete surfaces shall be carefully protected from drying. Continuous water curing is preferred. Curing compounds shall be white pigmented.

3.10 COLD WEATHER CONCRETING

- A. Conditions of this section shall apply, in addition to all other sections of the specifications, when placing concrete in cold weather. Cold weather is defined as a period when, for more than 3 successive days, the average daily temperature drops below 40°F. When temperatures above 50°F occur during more than half of any 24-hour period, the period will no longer be regarded as cold weather. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. Cold weather concreting shall conform to all requirements of ACI 306.1, except as modified by the requirements of these specifications.
- B. Detailed procedures for the production, placement, protection, curing, and temperature monitoring of concrete during cold weather shall be submitted to ENGINEER. Cold weather concreting shall not begin until these procedures have been reviewed for conformance with ACI 306.1.
- C. All concrete materials, forms, ground, mixing equipment, and other surfaces with which the concrete is to come in contact shall be free from frost, and the temperature of contact surfaces shall be 35°F or above. Ground upon which concrete is to be placed shall not be frozen at any depth.
- D. The mixing water and aggregates shall be heated and when entering the mixer shall have temperatures not exceeding 175°F and 80°F, respectively. Concrete temperature as mixed

shall not exceed 80°F and shall typically be between 55°F and 70°F. Concrete, when placed in the forms, shall have a temperature of not less than 50°F.

- E. Freshly placed concrete shall be protected by adequate covering, insulating, or housing and heating. If heating is used, ambient temperature inside the housing shall be maintained at a minimum of 70°F for 3 days or 50°F for 5 days. The maximum ambient temperature during curing shall not exceed 80°F. If insulating methods are used, recommendations contained in ACI 306R shall be followed. Surface temperature shall be maintained at 50°F for 7 days. After the curing period, the temperature of the concrete shall be reduced uniformly at a rate not to exceed 40°F per 24 hours until outside air temperature is reached. Heating of enclosure shall continue if it is anticipated that the outside air temperature will drop more than 20°F in the next 24 hours. The concrete temperature shall be obtained by attaching a thermometer provided by CONTRACTOR to the concrete surface. Concrete shall be kept moist.
- F. If heating is used, the housing shall be constructed weathertight and shall be constructed in a manner that will provide uniform air circulation and air temperatures over the complete concrete area that is being cured. Special attention shall be given to the edges and ends of a concrete pour with the housing extending at least 5 feet beyond any concrete surface being protected. The housing shall be in place and heat applied within 2 hours after concrete placement.
- G. Heating may be by steam or hot air. Heaters shall be vented to outside of the housing. Open burning salamanders will not be permitted. Heating devices shall not be placed so close to the concrete as to cause rapid drying or discoloration from smoke.
- H. If heating is used, CONTRACTOR shall provide sufficient 24-hour inspection of the heaters to provide compliance with the above-specified temperature requirements during the curing period. CONTRACTOR shall provide maximum-minimum thermometers for ENGINEER's use.
- I. The use of calcium chloride, salts, or other chemical admixtures for the prevention of freezing is prohibited.
- J. Salts or other deleterious materials shall not be used on temporary or permanent structures above concrete surfaces that are being placed, finished, or cured.

3.11 FINISHING

- A. Flat Work:
 - 1. Floated Finish: Place, consolidate, strike off, and level concrete eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared, and the surface has stiffened sufficiently to permit the operation. Immediately refloat the slab to a uniform texture.
 - 2. Light Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks.
 - 3. Hard Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
 - 4. Tolerance for concrete floors shall be 1/4 inch within 10 feet in any direction. Straight edge shall be furnished by CONTRACTOR.

5. Broom or Belt Finish: Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a broom or burlap belt across the surface.
 6. The above finishes shall be used in the following locations:
 - a. Float Finish: Surface to receive roofing, waterproofing, or sand bed terrazzo.
 - b. Light Troweled Finish: Submerged tank slabs.
 - c. Hard Troweled Finish: Building floors.
 - d. Broom or Belt Finish: Exterior slabs, sidewalks, tops of walls, and tank slabs to receive grout topping.
- B. Formed Surfaces:
1. Within 2 days after removing forms and prior to application of a curing compound, all concrete surfaces shall be observed and any poor joints, voids, stone pockets, or other defective areas shall be patched at once before the concrete is thoroughly dry. Defective areas shall be chipped away to remove all loose and partially bonded aggregate. The area shall be thoroughly wetted and filled with as dry as practical mortar mix placed to slightly overfill the recess. Mortar shall include a bonding agent. After partial set has taken place, the excess mortar shall be removed flush with the surface on the concrete using a wood float. All patching shall be cured, protected, and covered as specified for concrete. All cracks, leaks, or moist spots that appear shall be repaired. No extra compensation will be allowed CONTRACTOR for such work.
 2. The exterior or removal portion of nonremovable ties shall be removed with the use of a special tool designed for this purpose. Cutting or chipping of concrete to permit removal of exterior portion will not be permitted.
 3. For nonremovable ties, tie rod holes left by the removal of the exterior portion of the tie and cone shall be thoroughly wetted and filled by ramming with as dry as practical mortar mix in such a manner such that it completely fills the hole. Mortar shall include a bonding agent. All patching shall be cured, protected, and covered as specified for concrete. The holes are to be filled immediately after removal of the exterior portion of the tie.
 4. Holes left by removable ties shall be filled by installing a neoprene plug near the center of the wall. The balance of the hole shall be filled with mortar as specified above to within 1 inch of the face of the wall. The remainder of the hole shall be filled with a waterproofing compound.
 5. All finished or formed surfaces shall conform accurately to the shape, alignment, grades, and sections as shown or prescribed by ENGINEER. All surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness. All sharp angles, where required, shall be rounded or beveled. Any formed surface to be painted shall be free of any material that will be detrimental to the paint. The surface of the concrete shall be given one of the following finishes immediately after form stripping:
 - a. Finish A shall be referred to as a sack finish. Surfaces shall be free of contaminants prior to sacking. After wetting the surface, a grout shall be rubbed in using a rubber float or burlap. After the grout hardens sufficiently, it shall be scraped from the surface with the edge of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a continuous, hard, dust-free uniform texture surface free from pinholes and other minor imperfections. Finish A will be required for all unpainted surfaces, interior surfaces of equipment rooms, operation areas, and permanently exposed vertical surfaces. Where steel-faced forms are used to form walls, the portion of wall to receive the sack finish shall first be roughened by brush blasting or other acceptable method to achieve a texture similar to 40 to 60 grit sandpaper.
 - b. Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the

surface. Finish B shall be provided for waterproof- and moistureproof-coated surfaces.

- c. Finish C shall be referred to as a finish that has surface imperfections less than 3/8 inch in any dimension. Surface imperfections greater than 3/8 inch shall be repaired or removed and the affected areas neatly patched. Finish C or smoother shall be provided for interior surfaces of wet wells, tanks, and channels from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.
- d. Finish D shall be the finish for surfaces that may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired. Finish D shall be provided for surfaces to be buried or covered by other construction such as masonry veneer.

- C. All precautions shall be taken to protect the concrete from stains or abrasions, and any such damage shall be removed or repaired under this Contract.

3.12 LOADING OF CONCRETE STRUCTURES

- A. No concrete structure or portion thereof shall be loaded with its design load until the concrete has obtained its specified 28-day compressive strength. This shall include but not be limited to vertical live load, equipment loading, water loading, groundwater loading, and backfill load. Concrete strength at time of loading shall be determined by testing field-cured concrete cylinders.
- B. Extreme care shall be taken so that construction loads do not exceed design loading of the structure.

3.13 WATER TEST

- A. All liquid-retaining structures shall be water-tested by CONTRACTOR before being faced with masonry or backfilled. The structure shall be filled with water, kept full for at least 24 hours, leaks or moist areas marked, and the structure or surrounding area drained. Repairs shall be made from the face of the concrete that is subjected to water pressure. Method of repair shall be reviewed by ENGINEER.
- B. Testing of the structure shall not take place until the last concrete placed in the structure has developed 28-day design strength as determined by testing field-cured concrete cylinders.
- C. After repair, the structure shall again be tested as above. Testing and repair shall continue until all leaks or moist spots have disappeared. Unless otherwise stated, water for testing shall be supplied by CONTRACTOR.

3.14 NONSHRINK GROUT

- A. Nonshrink, nonmetallic grout shall be used for filling recesses and pockets left for equipment installation and for setting of base plates. The material used shall be approved by ENGINEER. Store, mix, and place the nonshrinking compound as recommended by the manufacturer. The minimum compressive strength shall be 5,000 psi at age 7 days and 7,500 psi at age 28 days.

3.15 TESTING AND SAMPLING

- A. The following tests of fresh concrete shall be performed by the SPECIAL INSPECTOR. The SPECIAL INSPECTOR shall prepare, protect, transport, and have tested all cylinders at his expense.
 - 1. Sampling of concrete for slump tests, air tests, temperature tests, and for making concrete test cylinders shall be performed in accordance with ASTM C172.
 - 2. Cylinders:
 - a. Three test cylinders shall be made for each pour less than 25 cubic yards, four test cylinders shall be made for each pour between 25 and 100 cubic yards, and eight test cylinders shall be made for each pour in excess of 100 cubic yards. Each concrete mix shall be represented by at least four cylinders for the entire job. Concrete for cylinders shall be collected near the middle of the load and/or as requested by ENGINEER.
 - b. Cylinders shall be made and tested in accordance with ASTM C31 and ASTM C39, respectively. The cylinders must be kept moist and at temperatures between 60°F and 80°F and shall remain undisturbed and stored in a location free from vibration. In hot weather, the cylinders shall be covered with wet burlap and stored in a shaded area. It is CONTRACTOR's responsibility to provide a suitable protected location for storing cylinders on the jobsite.
 - c. After 24 hours, the cylinders shall be transferred to an independent testing laboratory acceptable to OWNER. The cylinders shall be packed in sawdust or other cushioning material for transit to avoid any bumping or jarring of the cylinders.
 - d. Cylinders shall be broken at 7 and 28 days or as requested by ENGINEER. Test results shall be transmitted immediately and directly to ENGINEER and OWNER. Test data shall include date and location of pour and concrete mix used.
 - 3. Slump Test: The SPECIAL INSPECTOR shall make one slump test near the beginning of all pours with two tests being made for all pours in excess of 25 yards or as requested by ENGINEER. Slump tests shall conform to ASTM C143.
 - 4. Air Test:
 - a. When air-entrained concrete is used, the air content shall be checked by CONTRACTOR near the beginning of all pours with at least two checks being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER.
 - b. The air contents shall be checked using the pressure method in accordance with ASTM C231. The pocket-sized alcohol air indicator shall not be used unless it is first used in conjunction with the pressure method test.
- B. All costs of additional testing and sampling of fresh or hardened concrete needed because of suspected or actual violation of the specifications shall be borne by CONTRACTOR.

3.16 RECORDS

- A. A record is to be kept of all concrete work. The record shall include the date, location of pour, concrete mix, slump, air content, test cylinder identification, concrete temperature, and ambient air temperature. In addition, for cold weather concreting the record shall include the daily maximum-minimum thermometer readings of all thermometers during the entire curing period for all concrete pours. The project representative will keep this record, and CONTRACTOR shall assist in obtaining needed information.

3.17 SIDEWALKS AND EXTERIOR SLABS

- A. Sidewalks shall be constructed where shown on the drawings. They shall be a minimum of 5 inches thick and shall slope away from buildings or structures at a rate of 1/4 inch per foot. Concrete shall be as previously specified. Sidewalks shall be constructed on 3 inches of

compacted granular fill. They shall have tooled joints of 1-inch minimum depth at approximately 5-foot centers with 1/2-inch preformed expansion joint filler at approximately 25-foot centers with one at all corners and located anywhere sidewalks abut structures and buildings.

3.18 CONCRETE REMOVAL AND PATCHING

- A. All areas disturbed as a result of concrete removal or repair shall be patched as specified in Bonding to Existing Concrete.

3.19 CURING AND SEALING INTERIOR BUILDING FLOORS

- A. Install cure-seal hardener product in accordance with manufacturer's instructions. Apply only to those floors noted to be sealed in the finish schedule.
- B. Where product will be used for moist curing, sealing and hardening, apply to new concrete as soon as the concrete is firm enough to walk on after troweling. Where product will be used for sealing and hardening only, surface must be free of dust, dirt, laitance, curing compounds, and any material that would inhibit the penetration of the product. In some instances, the floor may need to be stripped and neutralized before application.
- C. Spray on at rate of 200 square feet per gallon.
- D. Keep surfaces wet with cure-seal hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather, slipperiness may appear before the 30-minute time period has elapsed. If that occurs, apply more cure-seal hardener as required to keep entire surface in a nonslippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a nonslippery state.
- E. After this period, when treated surface becomes slippery, lightly mist with water until slipperiness disappears.
- F. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal hardener.
- G. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
- H. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.
- I. Protect installed floors until chemical reaction process is complete; at least 3 months.
- J. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- K. Protection and cleaning of floors are the responsibility of CONTRACTOR until final completion. Replace concrete that becomes stained because of improper precautions or lack of cleaning.

END OF SECTION

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1–GENERAL

1.01 SUMMARY

- A. Clearing and grubbing consists of removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish, and other objectionable matter within street rights-of-way, drainage easements, or within the construction limits of other improvements.

1.02 MEASUREMENT AND PAYMENT

- A. Unless otherwise stated in the bid form, no separate payment will be made for work performed under this specification.

PART 2–PRODUCTS

2.01 PRODUCTS

- A. CONTRACTOR may use equipment and materials necessary to properly complete clearing and grubbing. Obtain approval for equipment and materials before beginning clearing and grubbing.

PART 3–EXECUTION

3.01 CLEARING

- A. Remove stumps, roots, rubbish, or other objectionable matter from the designated areas. Trees within 10 feet of drainage easements and within back slopes for interceptor ditches may be removed where required for construction operations.

3.02 GRUBBING

- A. Remove stumps and roots within pavement section to depth of 2 feet below finish subgrade elevation. For areas outside pavement section, remove stumps and roots to depth of 2 feet below finished surface of required cross-section.

3.03 PRESERVATION

- A. Protect trees left within street right-of-ways and designated for preservation. Take special care not to damage trees designated for preservation which are outside limits of clearing and grubbing.

3.04 REMOVING MATERIAL

- A. Unless otherwise specified, all cleared and grubbed material becomes property of CONTRACTOR to be removed from the work site or disposed of in a manner not to damage OWNER.

END OF SECTION

SECTION 31 23 00

EXCAVATION, FILL, BACKFILL, AND GRADING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
 - 1. Excavating for footings, foundations, roads, utilities, sidewalks, driveways, parking lots, restoration, and miscellaneous areas.
 - 2. Furnishing and placing all fill and backfill.
 - 3. Provide compaction of all fill and backfill.
 - 4. Furnishing and placing vapor barrier and granular cushion below interior slabs on grade.
 - 5. Furnishing and placing of crushed stone mat below tank slabs and manhole/vault slabs, basement floors, or other structures where required.
 - 6. Rough and finish grading prior to paving, seeding, etc.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- C. Payment:
 - 1. Common excavation shall include all excavation specified, undercutting, fill, backfill and grading, except rock excavation and unsuitable foundation material, as hereinafter described. No separate payment.

1.02 REFERENCED STANDARDS

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications within this section shall refer to the State of Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, current edition, including all issued supplemental specifications.
- B. ASTM C33—Standard Specification for Concrete Aggregates.
- C. ASTM D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D. ASTM D1557—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.03 SUBMITTALS

- A. Submit sources and gradations for materials proposed for use as compacted fill, utility trench backfill, trench bedding and cover material, crushed stone mat, and granular cushion.
- B. Submit samples of materials proposed for use in Paragraph 1.03.A to a soils testing laboratory for analysis of its suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.

- C. Submit sufficient samples of each different type or classification of soil to obtain representative values.

1.04 JOB CONDITIONS

- A. The elevations shown for existing work and ground are reasonably correct but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- B. No soil borings were made for this project. CONTRACTOR shall conduct its own investigation to determine physical conditions at the site which may affect the work.

1.05 MEASUREMENT AND PAYMENT

- A. All excavation, filling, back-filling, and grading is incidental to their related bid items unless otherwise indicated on the bid form.

PART 2-PRODUCTS

2.01 COMPACTED FILL

- A. All fill and backfill material designated to be compacted fill shall be granular with no stones larger than 4 inches and shall be reasonably well-graded throughout the particle size range. A minimum 65% of the material shall pass the 3/4-inch sieve, and the material shall be capable of being compaction tested in accordance with ASTM D1557 D698, as determined by the Project Soils Engineer. Of that portion of the material passing the No. 4 sieve, not more than 25% shall pass the No. 200 sieve, and material shall have less than 5% clay content. When placing fill during wet weather or in wet areas, this requirement shall be modified to not more than 5% passing the No. 200 sieve. Adequately dewatered areas are not defined as wet areas.
- B. Native material may be used as compacted fill if it meets the above specification. CONTRACTOR shall determine whether native material meets the above specification. CONTRACTOR shall provide all needed fill material whether from on-site or off-site at no additional cost to OWNER.

2.02 CRUSHED STONE MAT

- A. Crushed stone mat below tank slabs, manholes, vault slabs and basement floors shall be 3/4-inch clear crushed stone and shall meet all requirements of ASTM C33 size No. 67.

2.03 GRANULAR CUSHION

- A. Granular cushion beneath floor slabs-on-grade shall meet requirements of Standard Specification 247.

2.04 EMBANKMENT FILL

- A. Embankment fill shall contain no stumps, brush, rubbish, or other perishable material. The top 12 inches of the earth embankment shall be earthy material free from large stones.

2.05 CONCRETE FILL

- A. Concrete fill shall be Class X concrete as defined in Section 03 30 00 Cast-In-Place Concrete or flowable fill as defined in this section.

2.06 CLAY FILL

- A. Clay fill shall contain at least 25% clay minerals (material finer than 0.002 mm).

2.07 FLOWABLE FILL

- A. Flowable fill shall be a self-compacting, self-leveling, material consisting of a mixture of fine aggregate and filler (as needed), water, and cementitious materials (Portland cement, fly ash, granulated blast furnace slag) that is in a flowable state at the time of placement meeting the requirements of the National Ready Mixed Concrete Association Guide Specification for Controlled Low Strength Materials (CLSM). The flowable fill shall be proportioned by the ready mixed concrete supplier on the basis of field experience and/or laboratory trial mixtures to produce a cohesive and nonsegregating mixture which has the following properties:
1. Minimum compressive strength: 50 psi.
 2. Maximum compressive strength: 150 psi.
- B. CONTRACTOR shall submit the following information well in advance of fill placement to avoid any delay in construction:
1. Gradation of fine aggregate.
 2. Design mix.
 3. Previous test results with 7- and 28-day compressive strengths.
 4. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
 5. Brand, type, principle ingredient, and amount of each admixture if used.

2.08 TRENCH BEDDING MATERIAL

- A. Bedding material shall be hard and durable and shall be made by crushing sound limestone or dolomite ledge rock, or crushed gravel aggregate. Bedding material shall conform to the requirements of ASTM C33 and shall conform to gradations shown in the following table. No native soil shall be used for bedding material.

PERCENTAGE BY WEIGHT PASSING INDICATED SIEVE

Size	2 1/2 IN	2 IN	1 1/2 IN	1 IN	3/4 IN	1/2 IN	3/8 IN	No. 4	No. 8	No. 16	No. 30	No. 100	No. 200
57			100	95-100		25-60		0-10	0-5				
8						100	85-100	10-30	0-10	0-5			
9						100	75-100	0-25	0-5				
10							100	85-100				10-30	

- B. All rigid sanitary sewer pipe and related appurtenances shall be bedded using material that conforms to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.
- C. Concrete and other rigid pipe used in nonsanitary sewer applications may be bedded using material that conforms to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

- D. Ductile and cast iron pipe shall be bedded in accordance with the Type 4 laying condition of AWWA C600. Bedding material shall conform to Size No. 57, No. 8, or No. 9. Where ductile iron pipe is polyethylene encased, bedding material shall conform to Size No. 8 or No. 9.
- E. Thermoplastic sanitary sewer pipe and related appurtenances shall be bedded using material that conforms to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.
- F. All other sanitary sewer pipe and related appurtenances shall be bedded using material that conforms to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.
- G. PVC water main or force main shall be bedded and covered in accordance with the Type 4 laying condition of AWWA C605. HDPE water main or force main shall be bedded and covered in accordance with ASTM D2774. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used. No native materials may be used.
- H. Bedding material for copper water services shall conform to Size No. 9 or No. 10.

2.09 TRENCH COVER MATERIAL

- A. Material which is to be placed from the bedding material to 1 foot above the top of the pipe shall be termed cover material. All trenches shall be backfilled by hand to 1 foot above the top of the pipe with cover material. Cover material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously in 6-inch layers and shall be compacted using hand tamping bars and/or mechanical tampers. Use special care in placing cover material to avoid injury to or movement of the pipe. Cover material shall consist of durable granular particles ranging in size from fine to a maximum size of 3/4 inch. Unwashed bank run sand and crushed bank run gravel will be considered generally acceptable cover material. Cover material shall generally conform to the following gradation specifications:

COVER MATERIAL GRADATION

Sieve Size	Percentage by Weight Passing
1 inch	100
3/4 inches	85 to 100
3/8 inches	50 to 80
No. 4	35 to 65
No. 30	--
No. 40	15 to 30
No. 200	5 to 15

- B. Native trench materials may be used for cover material if they substantially conform to the above gradation specifications and a suitable credit is extended to OWNER.
- C. All bedding materials may be substituted for cover material when requested by CONTRACTOR except where polyethylene encasement is used. In such case, only those bedding materials specifically noted for polyethylene encasement may be used.

- D. Material that is to be placed from the bedding material around and to 1 foot above the top of all pipes shall be termed cover material. Except as otherwise specified, (a) cover material shall consist of durable granular particles ranging in size from fine to coarse in a substantially uniform combination, (b) unwashed bank-run sand and crushed bank-run gravel will be considered generally acceptable for cover material, (c) no stones larger than 3/4-inch in their greatest dimension shall be allowed in the cover material, and (d) native materials may be used if they conform to the above specifications. Cover material for copper piping shall be Size No. 10. Cover material for PVC pressure or other thermoplastic piping may be Size No. 10.

2.10 TRENCH BACKFILL MATERIAL

- A. Backfill shall be that material placed between the top of cover material up to subgrade for placement of restoration materials. Backfill for storm inlets shall be bedding material.
- B. When the type of backfill material is not otherwise specified or shown on the Drawings, CONTRACTOR may backfill with the excavated material, provided that such material consists of loam clay, sand, gravel, or other materials which, in the opinion of Project Soils Engineer, are suitable for backfilling.
- C. All backfill material shall exceed a temperature of 35°F and be free from frost, cinders, ashes, refuse, vegetable or organic matter, boulders, rocks, or stone, frozen lumps, or other material which in the opinion of Project Soils Engineer is unsuitable. From 1 foot above the top of the pipe to the trench subgrade, well-graded material containing stones up to 8 inches in their greatest dimension may be used, unless otherwise specified. Care should be taken in backfilling so as not to damage the installed pipe.
- D. In refilling the trench, if there is not sufficient material excavated therefrom suitable for refilling, CONTRACTOR shall, without extra compensation, furnish the deficiency. Where indicated on the Drawings, fill shall be provided over projecting conduits. Such fill shall be free of large boulders, and the top 6 inches shall be of suitable material to fit the adjoining ground.
- E. When called for on the Drawings, in the specifications, or requested by ENGINEER, backfill material shall be granular and shall consist of durable particles ranging in size from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids in the coarse material. No stones over 3 inches or clay lumps shall be present. Unless otherwise allowed by ENGINEER, granular backfill shall generally conform to the following gradation specification:

GRANULAR BACKFILL

Sieve Size	Percentage by Weight Passing
3 inches	100
2 inches	95 to 100
No. 4	35 to 60
No. 200	5 to 10

PART 3-EXECUTION

3.01 GENERAL

- A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

3.02 PROTECTION

- A. CONTRACTOR shall provide all necessary sheeting, shoring, or other soil retention systems including all labor, material, equipment, and tools required, or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheeting, shoring, and other soil retainage systems shall be withdrawn or removed in a manner so as to prevent subsequent settlement of structures, utilities, and other improvements.
- B. Design of sheet piling and other soil retaining systems shall be the sole responsibility of CONTRACTOR. Where such systems are shown on the drawings, no parameters such as embedment depth, section profile, presence or lack of walers, etc., nor system type or suitability shall be inferred. CONTRACTOR is responsible for designing and providing a fully functional system compatible with construction and site requirements.
- C. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

3.03 FINISH ELEVATIONS AND LINES

- A. CONTRACTOR shall furnish and place in position all items necessary to control the horizontal and vertical accuracy of the Work including lasers, batterboards, string lines, plummets, and graduated poles.
- B. Where lasers are used, CONTRACTOR shall check the Work against intermediate grade stakes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.
- C. If existing property stakes, not within the limits of the trench or street slope limits, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.

3.04 COMMON EXCAVATION

- A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.
- B. All excavated material that does not meet the specification for compacted fill or embankment fill or meets the specification but is not required for backfill or fill shall be classified as excess material and shall be removed from the site and disposed of at CONTRACTOR's expense.

- C. CONTRACTOR shall place the excess material on the site in locations as designated by OWNER. The hauling cost shall be at CONTRACTOR's expense unless otherwise specified.
- D. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under concrete to be poured on ground.
- E. Excavation for all footings, foundation walls, pits, etc., shall be large enough to provide adequate clearance for the proper execution for the work within them.
- F. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 31 23 19–Dewatering.
- G. No footings or slabs shall bear on the top 2 feet of existing soil. Where planned subgrade is within 2 feet of existing grade, remove soils to 2 feet below existing grade and backfill with compacted fill up to subgrade elevation.
- H. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation 1 foot plus a distance at least equal to the depth of undercut below footing grade.
- I. CONTRACTOR shall backfill and compact all overexcavated areas.
- J. All street excavation shall be performed as called for in Section 110 of the Standard Specifications and as herein modified.
- K. The following items of Work shall be included in common excavation:
 - 1. The excavation to subgrade elevations as detailed in the Drawings including road bed areas, terraces, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
 - 2. Removal (and stockpiling, if the use of salvaged topsoil is required) of topsoil from all cut areas and fill areas within a 1:1 slope of finished street, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
 - 3. The preparation, grading, compaction, and proof-rolling of subgrade areas for roadbed, sidewalks, bike paths, driveways, and other miscellaneous surface improvements to the elevations detailed on the Drawings.
 - 4. Excavation and grading required to realign and/or create ditch lines and drainage ways to route drainage to or from storm facilities as shown on the Drawings, or as necessary to maintain positive drainage.
 - 5. Removal of temporary backfill placed in new utility trenches above the subgrade.
 - 6. The removal and disposal of all undesirable and surplus materials.
- L. Common excavation may be completed as part of utility construction prior to initiating general street excavation activities.
- M. All subgrade areas in streets and parking lots, including utility trench restoration areas, shall be proof-rolled with a heavily loaded triaxle dump truck or other similar equipment requested by ENGINEER prior to the placement of any fill materials or base course. ENGINEER must be present during proof-rolling to review the Work necessary for the stabilization of any unstable areas identified.

- N. Saw cuts shall be made in existing pavement, driveways, curb and gutter, and sidewalks to allow restoration to neat straight lines. Saw cuts damaged during construction shall be recut prior to beginning restoration.
- O. CONTRACTOR shall salvage suitable materials from utility and street construction activities to provide fill for street construction. Where sufficient quantities of materials suitable for street construction are not available from areas of the site, CONTRACTOR shall perform borrow excavation to make up the deficit in accordance with Section 132 of the Standard Specifications.

3.05 UTILITY TRENCH EXCAVATIONS

- A. Caution In Excavation; CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures may be determined and shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on its part.
- B. Subsurface Exploration: When determined that it is necessary to explore and excavate to determine the location of existing underground facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is asked to perform additional Work in making the explorations and excavations, extra compensation will be allowed as specified In the General Conditions.
- C. The trench shall be dug so that the utilities can be laid to the alignment and depth specified. Unless otherwise allowed by ENGINEER, trenches shall not be excavated more than 100 feet in advance of pipe laying. Earth excavation shall include all excavation except rock. Included in earth excavation shall be removal of street paving of all types, existing structures, existing improvements and trees smaller than 4 inches in diameter measured 4 feet above the ground, all as necessary to complete the pipe installation.
- D. The trench shall be finished to the depth necessary to provide a uniform and continuous bearing and support for the pipe on the bedding material provided at every point between bell holes. Any part of the bottom of trench excavated below the specified grade shall be corrected with bedding material, thoroughly compacted in place. The bedding shall be shaped and finished with hand tools to fit the bottom quadrant to the pipe.
- E. If unstable soil conditions are encountered at subgrade, CONTRACTOR shall replace the unstable soil with special bedding. CONTRACTOR shall be allowed extra compensation for the special bedding, unless the unstable soil conditions are caused by CONTRACTOR's failure to adequately dewater the trench, in which case CONTRACTOR shall bear the entire cost.
- F. All excavated material shall be piled in a manner that will not endanger the Work. Stockpiles not for immediate backfilling shall have silt fences placed around their perimeter for erosion control. The Work shall be conducted in such a manner that pedestrian and motor traffic is not unnecessarily disrupted. Fire hydrants, valve boxes and manholes shall be left unobstructed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed.
- G. Excavated material designated by ENGINEER as being undesirable for backfilling and all surplus excavated material shall be immediately removed as excavation progresses. All such material shall be disposed of in an environmentally safe manner in accordance with local, state, and federal regulations. No such materials shall be disposed of in wetlands,

floodplains, or other environmentally sensitive areas. Disposal sites are also subject to approval of OWNER. All undesirable and surplus material disposed of must be leveled off and graded to rough elevations as determined by OWNER. Appropriate erosion control measures shall be provided and maintained at disposal sites until disposal is complete and the disposal site is permanently stabilized.

- H. CONTRACTOR shall remove bituminous pavement and road surface as a part of the trench excavation. The width of pavement removed shall be the minimum possible, and acceptable, for convenient and safe installation of utilities and appurtenances.
- I. All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the trench.
- J. Where it is necessary to trench through concrete pavement, a strip shall be sawed and removed in such a manner as not to disturb the remainder of the pavement. Paving and undermining of existing concrete pavement shall be prevented by CONTRACTOR. If CONTRACTOR unnecessarily removes or damages pavement or surfaces beyond limits acceptable to ENGINEER, such pavement and surfaces shall be replaced or repaired at the expense of CONTRACTOR.
- K. All trees, shrubs, and improved areas outside the easement location can be relocated or removed should they interfere with construction of the project. CONTRACTOR is not responsible for replacing any planting or improvements that were located within the easement.
- L. CONTRACTOR is responsible for maintaining fences as necessary to secure private property such as public safety, cattle horses, pets, etc. Where fence lines cross existing easements, CONTRACTOR shall an access gate in accordance with the details shown in the Drawings.
- M. Pipe shall be placed only on dry foundations.
- N. Excavation shall include all necessary incidental work such as tunneling, sheet piling, shoring, underpinning, pumping, bailing, transportation, and all fill and backfilling.
- O. CONTRACTOR shall excavate whatever materials, are encountered as required to place at the elevations shown, all pipe, manholes, and other work as required to complete the project as shown.
- P. The excavation at the crossing of all underground utility services in place shall be as narrow as practicable. All underground services shall be protected from damage and maintained in service at their original location and grade during the process of the work. Any damage to underground services shall be replaced or repaired at no cost to OWNER or to the owner of the service. The present underground services shown on the Drawings are located in accordance with available data. Encountering these services at a different location or encountering services not shown shall not release CONTRACTOR from the above-stated conditions
- Q. Any water, drainage, gas sewer, or electric lines encountered in the excavation that are not to be disturbed shall be properly underpinned and supported. Any service connections encountered that are to be removed shall be cut off at limits of the excavation and capped.

- R. CONTRACTOR shall be responsible for determining and providing the minimum width necessary to provide a safe trench in accordance with current OSHA standards and all other applicable standards. The top width of trench excavation shall be kept as narrow as is reasonably possible and acceptable to minimize pavement damage. Pay items related to maximum trench widths shall not limit CONTRACTOR's responsibility to provide safe trench conditions.
- S. Width of Trench—Rigid Pipe: The width of trench below the outside top of the pipe shall be as shown in the following table for the sizes listed. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching. If sheeting is used and is going to remain in place, the trench width shall be measured as the clear distance between inside faces of the sheeting. Otherwise, the trench width shall be based on the width between stable trench walls after sheeting is removed.

MAXIMUM WIDTH OF TRENCH BELOW TOP OF PIPE

Nominal Pipe Diameter (Inches)	Trench Width (Inches)
4	30
6	30
8	36
10	36
12	36
15	36
18 and larger	48

- T. Where the width of trench below the outside top of the pipe barrel cannot be otherwise maintained within the limits shown above, CONTRACTOR, at its own expense, shall furnish an adequate pipe installation for the actual trench width which will meet design conditions. This may be accomplished by furnishing higher class bedding, a stronger pipe, concrete cradle, cap or envelope or by driving sheeting prior to excavation to subgrade. Removal of sheeting below the top of the pipe, if allowed by ENGINEER, shall be gradual during backfilling.
- U. If the maximum trench width is exceeded for any reason other than by request of ENGINEER, the concrete cradle, cap, sheeting, bedding or the stronger pipe shall be placed by CONTRACTOR at its own expense. Where the maximum trench width is exceeded at the written request of ENGINEER, the concrete cradle, cap, sheeting, bedding or stronger pipe will be paid for on the basis of the price bid.
- V. Width of Trench—Thermoplastic and Ductile Iron Pipe: The trench width for flexible pipe shall be minimum three times the pipe outside diameter or the maximum trench width specified for rigid pipe, whichever is greater. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching.
- W. Special bedding shall consist of stone material and filter fabric as described herein. Where the bottom of the trench at subgrade is found to be unstable or of unsuitable material, which should be removed, CONTRACTOR shall excavate and remove such unstable or unsuitable material to the trench width and to a depth of 2 feet. The excavated area shall be lined with

filter fabric, Mirafi 140 N, US Fabrics US 120NW, Propex Geotex 401, or equal, and backfilled with bedding material in maximum 12-inch layers. At subgrade the filter fabric shall be wrapped over the special bedding with an 18-inch overlap. Bedding material shall then be placed over the special bedding to support the piping. See Dewatering and Excavation to Subgrade sections for additional conditions.

- X. If soil conditions require it, concrete cradle or encasement shall be placed around the pipe. Excavation shall be carried below the grade line to a depth requested by ENGINEER and concrete cradle, or encasement placed. Before the concrete is placed, the pipe shall be laid to line and grade, blocked and braced, and the joint made. The cradle shall then be placed, taking care not to disturb the pipe. Concrete shall have a minimum 28-day compressive strength of 4,000 psi. Concrete cradle shall not be used for thermoplastic piping. See Trench Width section for additional conditions.
- Y. Open-cut trenches shall be sheeted and braced as required by any governing federal regulations including OSHA, state laws, and municipal ordinances; and as may be necessary to protect life, property, improvements, or the Work. Underground or aboveground improvements to be left in place shall be protected and, if damaged, shall be repaired or replaced at the expense of CONTRACTOR.
- Z. Sheeting and bracing which is to be left in place must be removed for a distance of 4 feet below the present or proposed final grade of the street, road, or land, whichever is lower. Trench bracing, except that which shall be left in place, may be removed after backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.
- AA. Portable Trench Box: Whenever a portable trench box or shield is used, special precautions shall be taken so as not to pull already jointed pipe apart or leave voids around the pipe wall. Whenever possible, the bottom edge of the box shall be kept at a level approximately even with the top of pipe. Cover material shall be placed to at least the top of pipe before moving the box ahead.
- BB. All trenches shall be backfilled using specified material so that excessive lengths of trench are not left open. In general, the backfilling operation shall proceed so that no more than 100 feet of trench is open behind the pipe laying operation.
- CC. Backfill shall be left below the original surface to allow for placement of restoration materials including pavement, base course, concrete, topsoil, sod, plus any pavement replacement specified in accordance with the Asphaltic Paving section herein. When settlement occurs, CONTRACTOR shall restore the surface improvements at its expense to maintain the finished surface.

3.06 PREPARATION OF SUBGRADE

- A. After the site has been cleared, stripped, and excavated to subgrade, thoroughly compact subgrade to the requirements specified for compacted fill below. Scarify and moisture condition the subgrade as recommended by the Project Soils Engineer.
- B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.

- C. All slab-on-grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer.
- D. ENGINEER may request the excavation of unsuitable materials in areas of unstable subgrade. The excavation of such materials, except in areas where CONTRACTOR has completed utility construction or placed street fill, shall be measured by ENGINEER for payment.
- E. The excavation and replacement of unstable utility trench backfill and/or street fill placed by CONTRACTOR shall be at CONTRACTOR's expense.
- F. Base course placed on unstable foundation shall be removed and replaced at CONTRACTOR's cost following excavation of the affected area.

3.07 COMPACTED FILL AND BACKFILL

- A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within 4 inches of the bottom of the topsoil or to the bottom of the structure or other improvement.
- B. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength.
- C. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of 10 feet from the structure.
- D. No fill shall be placed under water or over unsuitable subgrade conditions.
- E. All fill and backfill, except embankment fill and clay fill, shall be compacted as follows:
 - 1. Class 1 Compaction: This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within 10 feet of structure walls. All compacted material shall be placed in uniform layers not exceeding 8 inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content (ASTM Test Designation D1557). Compaction shall be obtained by compaction equipment appropriate for the conditions.
 - 2. Class 2 Compaction: This class of compaction shall be used in excavated areas beyond 10 feet of structures without any piping or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.
- F. No frozen material shall be placed, nor shall any material be placed on frozen ground.
- G. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

3.08 EMBANKMENT FILL

- A. Embankment fill may be placed in fill areas to be seeded or sodded if no piping exists in the fill and the areas are at least 10 feet from any structure.
- B. Embankment fill shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be obtained for each layer before any material for a succeeding layer is placed thereon. Compaction shall be obtained using the hauling and leveling equipment, and in addition, tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment required to produce the desired results.

3.09 CONCRETE FILL

- A. In areas where there is inadequate room for compaction equipment and in other areas as shown or specified, flowable fill shall be used as fill material.

3.10 PLACING GRANULAR CUSHION AND VAPOR BARRIER

- A. When subgrade is prepared for slab-on-grade areas, CONTRACTOR shall place the vapor barrier and granular cushion.

3.11 PLACING CRUSHED STONE AND GEOTEXTILE FABRIC

- A. The same day that the subgrade is exposed, place geotextile fabric on subgrade, and place 12 inches of crushed stone mat below tank slabs, manholes, vault slabs, and basement floors. Compact in place.
- B. Geotechnical fabric shall extend up the side edge of the stone mat and extend across the top of the stone to a minimum of 12 inches past the edge of base slab.

3.12 PIPE BEDDING AND COVER

- A. Immediately prior to placing the pipe, the trench bottom shall be shaped by hand to fit the entire bottom quadrant of the pipe. If pipe is of the bell and spigot type; bell holes shall be provided to prevent the bell from supporting the backfill load. Bell holes shall be large enough to permit proper making of the joint, but not larger than necessary to make the joint. All adjustments to line and grade must be done by scraping away or filling in bedding material under the body of the pipe. Any fill used must be bedding material. If necessary to obtain uniform contact of the pipe with the subgrade, a template shall be used to shape the bedding material. All pipe shall be placed on bedding material at least 4 inches thick. Bedding material shall then be placed and tamped into place up alongside the pipe in maximum 6-inch layers shovel slicing the bedding material under the haunches to provide firm contact with the pipe. CONTRACTOR shall perform all necessary excavation and shall furnish all necessary material to provide this bedding.
- B. Trenches shall be kept water-free and dry during bedding, laying, and jointing. CONTRACTOR shall provide, operate, and maintain all pumps or other equipment necessary to drain and keep all excavation pits and trenches and the entire subgrade area free from water under any and all circumstances that may arise,

3.13 TRENCH BACKFILL CONSOLIDATION

- A. All trenches shall be consolidated as specified in this section for the entire depth and width of the trench.
- B. Consolidation shall be achieved by use of smooth surface vibratory compactors or backhoe operated hydraulic compactors for granular materials and rotating sheepsfoot type mechanisms for loam/clay soils. The lift height shall not exceed 8 inches for walk behind, hand operated, vibratory compactors and sheepsfoot. Lift height shall not exceed 24 inches for self-propelled vibratory drum or backhoe operated hydraulic compactors. Smaller lift heights shall be provided as necessary to achieve the degree of compaction specified.
- C. Unless specified otherwise, backfill material beneath paved areas or future paved areas and within 5 feet of paved areas or future paved areas shall be consolidated as follows: Within 3 feet of the surface 95% of maximum dry density, below 3 feet from the surface to 1 foot above the pipe 90% of maximum dry density, as determined by the modified Proctor Test (ASTM D1557).
- D. Unless otherwise specified, backfill material placed in all other areas shall be compacted to the point where no additional consolidation can be observed from the compaction and backfill equipment being used.
- E. Backfill material not meeting the compaction specification shall be recompacted by CONTRACTOR at no cost to OWNER. Cost for additional testing on recompacted material shall be at CONTRACTOR's expense.

3.14 GRADING

- A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the drawings.
- B. Grading Tolerances:
 - 1. Rough Grade: Buildings, parking areas, and sidewalks— ± 0.1 feet.
 - 2. Finish Grade: Granular cushion or crushed stone mat under concrete slabs— ± 0.03 feet.
 - 3. Lawn areas away from buildings, parking areas, and sidewalks— ± 0.25 feet.

3.15 MAINTENANCE OF SURFACE

- A. CONTRACTOR shall maintain all backfilling, resurfacing, repaving, and other surface improvements constructed under this Contract. CONTRACTOR shall, upon proper notice from OWNER, make all repairs in surfaces of trenches and excavations. All expenses incurred by OWNER and/or CONTRACTOR in making repairs and all expenses in maintaining trench and excavation surfaces shall be at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. OWNER reserves the right to make all emergency repairs necessary to make safe all streets and walks at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. A maintenance guarantee fund, if specified, will be withheld from the final amount due CONTRACTOR for a period of 6 months, after acceptance of the Work, to provide such maintenance.
- B. CONTRACTOR shall be responsible for controlling dust dispersion during utility and street construction. Remedial actions required as a result of inadequate dust control shall be

CONTRACTOR's responsibility. To control dust, CONTRACTOR shall apply calcium chloride or ammonium lignin sulfonate in 12 to 14% solution or other dust control palliative acceptable to OWNER. Prior to application of dust palliative, the street shall be graded smooth.

3.16 COMPACTION TESTING

- A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer and paid for by OWNER.

3.17 EXCAVATED SOLID WASTE FILL MATERIALS TO BE LANDFILLED

- A. If any solid waste fill materials are encountered, they shall be excavated and removed to a licensed sanitary landfill. Solid waste fill material is defined as any construction or demolition debris, household refuse, glass, metal, plastic, or similar material not native to the site, but having been placed on-site during past filling operations and mixed with soil. Allowance as specified shall apply.

3.18 POTENTIALLY HAZARDOUS WASTE

- A. If CONTRACTOR encounters during excavation or trenching activities any potentially hazardous waste as defined in this section, and the materials are within the limits of the site excavation or trenching work, the materials shall be handled as specified in this section. Potentially hazardous waste is defined as any drums, containerized waste, or organic liquid waste or surrounding impacted material. Such materials have not been found during investigations performed to date but could potentially be encountered.
- B. Should potentially hazardous waste be encountered, excavation activities in that portion of the site shall be placed on standby pending removal of the material, receipt of test results, and determination by the TCEQ and OWNER on whether work may proceed. It is anticipated that this standby time will be approximately 48 hours per occurrence, exclusive of weekends and holidays.
- C. Potentially hazardous waste defined above shall be carefully excavated, stockpiled, and tested to determine if they exhibit the characteristics of a hazardous waste as defined by the Texas Administrative Code Part 1, Chapters 323 and 335. Such materials shall be handled according to applicable TCEQ, USEPA, and OSHA regulations and shall be stockpiled in a "Temporary Excavated Material Storage Area" as specified in Division 01. Stockpiling shall meet the requirements of NR 700.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Removal of groundwater to allow belowgrade construction.
 - 2. Site grading to prevent surface water from entering the excavation.
- B. Related Sections and Divisions:
 - 1. Applicable provisions of Division 01 shall govern work in this section.
 - 2. Section 31 25 00—Slope Protection and Erosion Control.
- C. Payment:
 - 1. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the work and for forming all dams or diversions, digging of sumps or pump wells, bailing, and installation and pumping of wells shall be borne by CONTRACTOR unless otherwise indicated on the bid form.
 - 2. CONTRACTOR shall include in the bid an allowance for \$32,500 for the cost of renting and mobilizing equipment for dewatering operations. The allowance shall be adjusted by change order (up or down) based on the actual costs of rental and mobilization to CONTRACTOR.
 - 3. CONTRACTOR may propose a price to cover costs of operating said equipment to OWNER. OWNER may review and approve said proposal at their own discretion.
 - 4. Any permits necessary.

1.02 REFERENCES

- A. See Division 01, Regulatory Requirements for permit requirements and water, erosion, and sediment control.

1.03 SYSTEM REQUIREMENTS

- A. CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures, mains, and appurtenances are being built, utilities are being installed, and fill and backfill are being compacted. Under no conditions shall the work be laid in or under water. No water shall flow over the work until the joints are complete or the concrete has set.
- B. Wherever necessary, CONTRACTOR shall excavate in advance of the completed work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.
- C. CONTRACTOR's dewatering system shall perform so that the soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, CONTRACTOR shall furnish and install well point systems or deep wells.

- D. Dewatering shall be sufficient to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade.
- E. In areas where rock is encountered, the water level shall be kept at or below top of rock, but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.
- F. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of "quick" conditions or "boils" shall be prevented.
- G. Dewatering systems shall be designed and operated so as to prevent the migration or removal of soils.

1.04 QUALITY ASSURANCE

- A. All dewatering shall be done in accordance with applicable federal, state, and local code requirements.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 DEWATERING

- A. Dewatering shall be started, and the water level shall be lowered as specified herein prior to beginning excavation and shall be continued until structure, main, or appurtenance has been completed and fill has been placed and compacted to final grade.
- B. CONTRACTOR shall provide at least two groundwater observation wells near each area to be excavated to aid CONTRACTOR in determining whether the minimum specified requirements have been met prior to excavation. The observation well shall be a minimum 2-inch-diameter slotted PVC pipe. The observation well shall be installed and backfilled in such a way as to allow an accurate determination of actual groundwater levels. The observation well shall be properly abandoned after use unless specified otherwise.
- C. CONTRACTOR shall provide all necessary materials and equipment to keep the excavation free from water during construction. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages, and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during the work stoppages.
- D. CONTRACTOR shall meet all requirements of applicable TCEQ permits for construction pit or trench dewatering.

- E. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

3.02 PROTECTION

- A. CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.
- B. Prior to dewatering, CONTRACTOR shall take into account the effect of its proposed dewatering operation on existing private water supply systems and shall make arrangements with property owners for protecting their supplies or providing alternative means of supply.
- C. In the event that CONTRACTOR's dewatering operation adversely affects private water supply systems, CONTRACTOR shall provide property owners with alternative potable and nonpotable supplies until dewatering operations are ceased and groundwater levels return to normal. If the water in private water supply wells is contaminated, through no fault of CONTRACTOR after restoration of original groundwater levels, OWNER will provide measures to restore water potability. CONTRACTOR is responsible for restoration of the water supply, not its potability after restoration.
- D. In areas where continuous operation of dewatering pumps is required, CONTRACTOR shall avoid noise disturbance to nearby residences to the greatest extent possible by using electric-driven pumps, or intake and exhaust silencers or housing to minimize noise from engine-driven generators or engine-driven pumps.

END OF SECTION

SECTION 31 23 23.46

CEMENT STABILIZED SAND

PART 1–GENERAL

1.01 SUMMARY

- A. This section provides for the use of cement stabilized sand as a utility bedding or backfill material or for structural backfill.

1.02 RELATED SECTIONS

- A. Section 31 23 00–Excavation, Fill, Backfill, and Grading.

1.03 MEASUREMENT AND PAYMENT

- A. Unless otherwise stated in the Bid Form, no separate payment will be made for work performed under this specification. Unless otherwise stated in the Bid Form, all costs shall be included in the related items of work listed in the Bid Form.

1.04 REFERENCES

- A. The applicable provisions of the following standards shall apply as if written here in their entirety: ASTM–American Society of Testing Materials.

1.05 SYSTEM DESCRIPTION

- A. Provide sand-cement mixture that will produce a minimum unconfined compressive strength of 100 pounds per square inch (psi) in 48 hours.

1.06 QUALITY ASSURANCE

- A. Upon request of ENGINEER, CONTRACTOR or their supplier will furnish samples of the sand and cement for testing before and/or during project construction. Samples shall be submitted two days prior to stabilized sand being delivered to the project site. If the material source is changed during project construction, new samples shall be submitted.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Material not in place within three hours of mixing will be rejected.

PART 2–PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

- A. Sand: Use clean durable sand containing not more than the following:
 - 1. Deleterious Materials.
 - a. Clay lumps, ASTM C142; less than 0.5 percent.

- b. Lightweight pieces, ASTM C123; less than five percent.
 - c. Organic impurities, ASTM C40; shall not show a color darker than the standard color.
 - d. Other deleterious materials such as coal, shale, coated grains of soft flaky particles; less than two percent.
2. Plasticity index shall be 4 or less when tested in accordance with ASTM D43 and ASTM D424.
 3. Gradation Requirements.

	% Retained
3/8-inch sieve	0%
1/4-inch sieve	0%–5%
10-mesh sieve	5%–35%
20-mesh sieve	15%–55%
40-mesh sieve	35%–85%
60-mesh sieve	60%–95%
100-mesh sieve	80%–97.5%
200-mesh sieve	95%–100%
270-mesh sieve	100%

4. Color test ASTM C40. Color not darker than standard color.
- B. Portland Cement. Furnish Portland cement to conform with ASTM C-150, Type 1.
 - C. Water. Water shall be reasonably clean and free from injurious amounts of oil, acid, alkalies, salt, organic matter, or other deleterious material.

PART 3–EXECUTION

3.01 PREPARATION

- A. Add not less than 1 1/2 sacks of Portland cement to stabilize 1 cubic yard of sand mixture. Mix thoroughly in an approved pug-mill type mixer. Stamp batch ticket with the time of loading.

3.02 ERECTION/ INSTALLATION/ APPLICATION AND/OR CONSTRUCTION

- A. Bedding
 1. Place cement-sand in a trench or excavation prepared for utility pipe to the depth shown on the drawings.
 2. After bedding material is in place, set pipes in position to grade.
 3. Add additional cement-sand material around pipe, filling to at least 12 inches above pipe crown. Place cement-sand material at optimum moisture content, and in layers not to exceed 6 inches measured loose.
 4. Compact with mechanical hand tamps to at least 95 percent of Standard Proctor Density, ASTM D698.
- B. Foundations: Use cement stabilized sand for stabilizing below the foundation for precast manholes, inlets or concrete structures.

C. Backfill:

1. When required, place cement-sand in utility trenches as backfill for lines under existing or future pavement.
2. Place cement-sand material at optimum moisture content in layers not to exceed 12 inches, measured loose.
3. Compact with mechanical hand tamps to at least 95 percent of Standard Proctor Density, ASTM D698.

3.03 FIELD QUALITY CONTROL

- A. Allow access to completed portions of bedding or backfill for field density testing by nuclear method.

END OF SECTION

SECTION 31 25 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Erosion control devices.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 PAYMENT

- A. All costs associated with slope protection and erosion control shall be included in CONTRACTOR's Bid. This work shall include, but is not limited to, erecting fence, excavation, placing posts, backfilling, attaching woven wire and geotextile fabric; placing ditch checks; installing sediment traps; removing the fence at completion of project; cleaning and repairing; removing or spreading accumulated sediment to form a surface suitable for seeding; replacing silt fence and damages caused by overloading of sediment material or ponding of water adjacent to silt fence; and furnishing labor, tools, equipment, and incidentals necessary to complete the work in accordance with the Contract.

1.03 REFERENCES

- A. State of Texas Department of Transportation Storm Water Management Guidelines for Construction Activities.
- B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Texas Department of Transportation, Standard Specifications for the Construction and Maintenance of Highways, Streets, and Bridges.
- C. Texas Commission on Environmental Quality (TCEQ) Erosion Control Best Management Practices (BMPs).

1.04 SUBMITTALS

- A. CONTRACTOR shall submit to ENGINEER a Stormwater Pollution Prevention Plan (SWP3) when a SWP3 is required for the project. CONTRACTOR shall also submit all required supporting documents including, but not limited to, a Notice of Intent (NOI) and a Notice of Termination (NOT) for stormwater discharges associated with construction activity under the Texas Pollutant Discharge Elimination System.

1.05 REGULATORY REQUIREMENTS

- A. Where land disturbance activities do not exceed one acre, CONTRACTOR shall maintain site conditions where erosion and pollution are controlled.
- B. CONTRACTOR and its subcontractors shall execute and sign the following certification:

"I certify under penalty of law that I understand the terms and conditions of the Texas Pollutant Discharge Elimination System Permit that authorizes the storm water discharges associated with industrial activities from the construction site and as may be detailed in the Contract Documents. I agree to indemnify and hold OWNER harmless from any claims, demands, suits, causes of action, settlements, fines, or judgments and the costs of litigation, including, but not limited to, reasonable attorneys fees and costs of investigation and arising from a condition, obligation or requirement assumed or to be performed by CONTRACTOR for storm water pollution and erosion control."

- C. CONTRACTOR shall pay any fines or other fees resulting from failure of CONTRACTOR to comply with the permit requirements.
- D. If at any point throughout the course of the project, the area of land disturbance increases above one acre for any reason, it shall be CONTRACTOR's responsibility to obtain a copy of the most recent version of the TCEQ Construction General Permit and comply with all additional erosion and sediment control requirements, pay all additional fees associated with complying with permit requirements, submit NOI, NOT, and any NOC required, develop and implement a SWP3, and pay any fines or fees resulting from failure of CONTRACTOR to comply with permit requirements.

1.06 QUALITY CONTROL

- A. Construct and maintain erosion sediment control measures in accordance with the Conservation Practice Standards.
- B. Check facilities weekly and after any rainfall event and make needed repairs within 24 hours.

PART 2-PRODUCTS

2.01 EROSION CONTROL PRODUCTS

- A. Erosion control products shall meet all applicable requirements of Item 506 of the Standard Specifications and the TCEQ Erosion Control BMPs.

PART 3-EXECUTION

3.01 GENERAL

- A. Install devices before construction activities begin.
- B. Proceed carefully with construction adjacent to stream channels to avoid washing, sloughing, or deposition of materials into the stream. If possible, the work area should be diked off and the volume and velocity of water that crosses disturbed areas be reduced by means of planned engineering works (diversion, detention basins, berms).
- C. Unless noted on drawings, do not remove trees and surface vegetation.

- D. Expose the smallest practical area of soil at any given time through construction scheduling. Make the duration of such exposure before application of temporary erosion control measures or final revegetation as short as practicable.
- E. CONTRACTOR shall provide a "qualified" inspector to inspect erosion control and sediment controls once in place. Inspector shall have prior experience with and knowledge of installation and maintenance of erosion and pollution controls. Unless stricter requirements are mandated by TCEQ or by any local permits, project site erosion control inspection shall be conducted every seven days and after each one-half-inch rainfall or greater. CONTRACTOR shall maintain hard copies of the inspection reports for the duration of the Project.
- F. Any necessary repairs to erosion and sediment control facilities shall be provided within 24 hours to all corrective measures noted on the inspection reports to address pollution issues. CONTRACTOR shall submit to OWNER a written notice stating the times, dates and actions taken to rectify the defective erosion and sediment controls.
- G. CONTRACTOR shall also make any necessary additions for erosion and sediment control as may result from on-site conditions or the progress of the Work or as may be required by DNR or OWNER.
- H. Disturbed areas shall be stabilized with temporary or permanent measures within 14 calendar days of the soil disturbance or redisturbance.
- I. All temporary erosion and sediment control measures shall be removed within 30 days after final stabilization is achieved or after the temporary measures are no longer needed. All sediment accumulated in temporary and permanent facilities shall be removed and properly disposed of and the area restored.
- J. Install all erosion control products and devices in accordance with the manufacturer's recommendations, Item 506 of the Standard Specifications, and the TCEQ Erosion Control BMPs.

END OF SECTION

SECTION 31 50 00

EXCAVATION SAFETY

PART 1—GENERAL

1.01 SUMMARY

- A. This section covers the minimum requirements and responsibilities of CONTRACTOR for excavations and shoring/safety of same.

1.02 MEASUREMENT AND PAYMENT

- A. The cost for performing the safety requirements set forth herein shall be paid for on a linear foot basis according to the depth of cut as set forth in the Bid or as otherwise provided for in the Bid and shall include all labor, materials, services, and equipment to perform this item of work.

1.03 REFERENCES

- A. OSHA—Occupational Safety and Health Administration, 29CFR, Part 1926

1.04 SYSTEM DESCRIPTION

- A. CONTRACTOR shall shore or otherwise protect excavations from cave-ins, protect employees from exposure to vehicular traffic, falling loads, hazardous atmospheres, water accumulation and unstable structures in and adjacent to excavations and provide acceptable means of access to and egress from excavations. Notwithstanding these suggestions, CONTRACTOR is solely responsible for the safety of his employees and the general public as they interface with this construction project.

1.05 SUBMITTALS

- A. CONTRACTOR shall furnish an excavation or trench safety plan for any excavation exceeding 20-foot depth. The safety plan must be signed and sealed by a Texas licensed professional engineer.
- B. The design calculation and design drawings are not shop drawings, but shall be submitted to ENGINEER separately from any other shop drawings for any system, material, or equipment specified. These calculations will be forwarded to OWNER for their records.

1.06 QUALITY ASSURANCE

- A. Excavation safety system shall meet the current standards established by OSHA, 29CFR, Part 1926, Subpart P-Excavations.
- B. Any construction not in accordance with OSHA regulations may not be eligible for payment and delays in construction to bring the project into OSHA regulations will not be the responsibility of OWNER or ENGINEER.

1.07 PROJECT/SITE CONDITIONS

- A. CONTRACTOR shall develop and implement an excavation safety program based on the actual conditions encountered on the project.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 GENERAL

- A. CONTRACTOR has the sole responsibility for providing an adequate excavation safety system. CONTRACTOR agrees that neither OWNER nor ENGINEER has such responsibility and CONTRACTOR shall not rely on OWNER or ENGINEER or any of their representatives for inspection, design, supervision, construction or any other aspect of excavation safety.

END OF SECTION

SECTION 32 11 00

FLEXIBLE BASE

PART 1—GENERAL

1.01 SUMMARY

- A. This section covers construction of a foundation course composed of flexible base. The base shall be constructed in one or more courses to the lines and grades shown on the Drawings. All construction procedures and materials shall be in accordance with TxDOT Item 247.

1.02 RELATED SECTIONS

- A. Section 31 23 00—Excavation, Fill, Backfill, and Grading.

1.03 MEASUREMENT AND PAYMENT

- A. The accepted materials and work for this item will be measured and paid for in accordance with Section 32 12 16.13. Flexible base shall be considered a part of the asphaltic concrete surface course and no separate payment will be made for this work and materials. The cost of this item shall be included with the cost of backfilling and asphalt replacement per linear foot of trench as detailed on the Drawings.

1.04 REFERENCES

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. TxDOT—Texas Department of Transportation—Standard Specifications For Construction of Highways, Streets and Bridges.

1.05 SUBMITTALS

- A. CONTRACTOR shall submit four copies of each submittal, which will be retained by ENGINEER, plus the number of copies that are to be returned to CONTRACTOR by ENGINEER after review is completed. The following information must be submitted:
 - 1. Samples and tests of aggregate.

1.06 QUALITY ASSURANCE

- A. CONTRACTOR shall provide at its expense, laboratory test results for the materials. CONTRACTOR must furnish, operate, and maintain templates, straight edges, scales, and other measuring and weighing devices necessary for proper construction and checking of work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store flexible base to prevent segregation of aggregate.

PART 2–PRODUCTS

2.01 MATERIALS AND/OR EQUIPMENT

- A. Materials shall consist of uncontaminated crushed or uncrushed coarse aggregate mixed with any approved binding material necessary to meet the specified requirements, resulting in uniform quality material. ENGINEER may sample and test project materials at any time before compaction throughout the project duration to provide specification compliance.
- B. Material Types. Do not use fillers or binders unless approved. Furnish the type specified on the Drawings in accordance with the following.
 - 1. Type A: Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.
 - 2. Type B: Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.
 - 3. Type C: Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I. Blending of two or more sources is allowed.
 - 4. Type D: Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements as set forth in TxDOT Section 247.2.A.3.b and be managed in a way to provide for uniform quality. ENGINEER may request separate dedicated stockpiles in order to verify compliance.
 - 5. Type E: As shown on the Drawings.
- C. Material Grades. Material shall consist of Grades 1-2, 3, 4, or 5 as specified in the Drawings, meeting the requirements as set forth in Table 1 of TxDOT Item 247. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1, unless shown on the Drawings.
- D. Material Tolerances: ENGINEER may accept material if no more than one of the five most recent gradation tests has an individual sieve outside the specified limits of the gradation. ENGINEER may accept material if no more than one of the five most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than two points.
- E. Water: Furnish water free of industrial wastes and other objectionable matter.
- F. Equipment: Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with TxDOT Item 210, "Rolling." Provide proof rollers in accordance with TxDOT Item 216, "Proof Rolling."
- G. Base material shall be secured from commercial sources and approved by ENGINEER. If non-commercial sources are proposed by CONTRACTOR and approved by ENGINEER, expose the vertical faces of all of strata of material proposed for use. Secure and process the material by successive vertical cuts extending through all exposed strata.

PART 3-EXECUTION

3.01 PREPARATION

- A. The subgrade shall be completed within specification and observed by ENGINEER prior to placement of base material.

3.02 ERECTION/ INSTALLATION/ APPLICATION AND/OR CONSTRUCTION

- A. Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the Drawings.
- B. Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 feet thick. Stockpiles must have a total height between 10 and 16 feet unless otherwise shown on the Drawings. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.
- C. Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Changes for additional sampling and testing required as a result of adding or removing material will be deducted from CONTRACTOR's estimates.
- D. Haul approved flexible base in clean trucks: Deliver the required quantity to each 100-foot station or designated stockpile site as shown on the Drawings. When delivery is to the 100-foot station, manipulate in accordance with the applicable Items.
- E. Preparation of Subgrade or Existing Base:
 - 1. Remove or scarify existing asphalt concrete pavement in accordance with TxDOT Item 105, "Removing Stabilized Base and Asphalt Pavement," when shown on the Drawings. Shape the subgrade or existing base to conform to the typical sections shown on the Drawings.
 - 2. When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.
 - 3. When shown on the Drawings, proof roll the roadbed in accordance with TxDOT Item 216, "Proof Rolling," before pulverizing or scarifying. Correct soft spots as requested.
- F. Placing:
 - 1. Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the Drawings. Maintain the shape of the course. Control dust by sprinkling. Correct or replace segregated areas, at no additional expense to OWNER.
 - 2. Place successive base courses and finish courses using the same construction methods required for the first course.

G. Compaction:

1. Compact using density control unless otherwise shown on the Drawings. Multiple lifts are permitted when shown on the Drawings or approved. Bring each layer to the recommended moisture content. When necessary, sprinkle the material in accordance with TxDOT Item 204, "Sprinkling."
2. Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least half the width of the roller unit. On superelevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph.
3. Rework, recompact, and refinish material that fails, to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to OWNER.
4. Ordinary Compaction: Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompact.
5. Density Control: Compact to at least 100% of the maximum density determined by Tex-113-E unless otherwise shown on the Drawings. Determine the moisture content of the material at the beginning and during compaction in accordance with Tex-103-E. ENGINEER will determine roadway density of completed sections in accordance with Tex-115-E. The work may be acceptable if no more than one of the five most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density in the section.

H. Finishing: After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4-inch. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the Drawings.

I. In areas where surfacing is to be placed, correct grade deviations greater than 1/4-inch in 16-foot measured longitudinally or greater than 1/4-inch over the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and recompact in accordance with TxDOT Item 247, Section 247.4.3., "Compaction."

J. Curing: Cure the finished section until the moisture content is at least 2 percentage points below optimum before applying the next successive course or prime coat.

3.03 REPAIR/RESTORATION

A. In areas on which surface pavement is to be placed, any deviation over 3/8-inch in 16 feet shall be corrected by loosening, adding or removing material, reshaping, and recompact by rolling and sprinkling. The surface course shall be checked for deviations by using a straightedge or template. All depressions, irregularities, or weak spots that develop shall be corrected by scarifying the areas, adding approved material required, reshaping and recompact by rolling and sprinkling. Additional base courses may be added once the preceding course has been compacted and cured.

3.04 FIELD QUALITY CONTROL

- A. Allow access to completed portions of flexible base for field density testing by nuclear method.

END OF SECTION

SECTION 32 12 16.13

HOT MIX ASPHALTIC CONCRETE PAVEMENT

PART 1—GENERAL

1.01 SUMMARY

- A. This section describes the furnishing and installing of a surface for pavement consisting of compacted mixture of coarse and fine aggregates and asphaltic material. Paving construction will be on stabilized subgrades and/or base to conform with the lines, grades, compaction thickness and the typical cross sections as shown on the Drawings.

1.02 MEASUREMENT AND PAYMENT

- A. The work performed and materials furnished for hot mix asphaltic concrete pavement shall be measured and paid for by the square yard at the unit price bid for asphaltic concrete pavement meeting the minimum thickness required. Prime and/or tack coat shall be considered a part of the asphaltic concrete surface course and no separate payment will be made for this work and materials. Mill and overlay asphalt pavement shall be measured and paid for by the square yard at the unit price bid for mill and overlay. Measurement will be from the edges of the full thickness of in place asphalt concrete surface. The unit price bid will be complete compensation for all equipment, materials, labor, and supervision required to construct asphaltic concrete surface course and mill and overlay as shown on the Drawings and for all equipment, materials, labor, and supervision required to adjust the elevation of manhole frames and covers, valve boxes, and other such utility access structures.

1.03 REFERENCES

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. AASHTO—American Association of State Highway and Transportation Officials.
 - 2. TxDOT—Texas Department of Transportation Construction Bulletin No. 14.
 - 3. TxDOT—Texas Department of Transportation—Standard Specifications For Construction of Highways, Streets and Bridges.

1.04 SYSTEM DESCRIPTION

- A. Hot mix asphaltic concrete pavement shall include prime coat and/or tack coat, and asphaltic mixture. Adjustment to the elevation of manhole frames and covers, valve boxes, and other such utility access structures to match the surface elevation of the new pavement is a part of the pavement operation.

1.05 SUBMITTALS

- A. CONTRACTOR shall submit four copies of each submittal, which will be retained by ENGINEER, plus the number of copies that are to be returned to CONTRACTOR by ENGINEER after review is completed. The following information must be submitted:
 - 1. Samples and tests of coarse aggregate and fine aggregate.
 - 2. Samples of any mineral filler.

3. Material submittal for prime coat.
4. Material submittal for tack coat.
5. Hot mix asphaltic concrete mix design and test results.

1.06 QUALITY ASSURANCE

- A. CONTRACTOR shall provide at his expense, laboratory test results for all the materials to be incorporated into the asphaltic concrete as well as the asphaltic concrete mix. CONTRACTOR must furnish, operate, and maintain templates, straight edges, scales, and other measuring and weighing devices necessary for proper construction and checking of work.

1.07 PROJECT/SITE CONDITIONS

- A. No asphaltic mixture, prime coat, nor tack coat shall be placed when the air temperature is below 50°F and falling but it may be placed when the temperature is 40°F and rising. Temperature readings shall be taken in the shade away from artificial heat. Place asphaltic mixtures only when weather conditions are suitable.

PART 2-PRODUCTS

2.01 MANUFACTURERS

- A. The materials must be approved by ENGINEER prior to the delivery of any materials.

2.02 MATERIALS AND/OR EQUIPMENT

- A. Aggregate: Composition of the mineral aggregate shall be of both a coarse aggregate and a fine aggregate and may include a mineral filler. If required, samples of aggregates shall be submitted for testing.
 1. Coarse Aggregate: The coarse aggregate shall consist of that part of the aggregate retained on a No. 10 sieve. The coarse aggregate shall consist of clean, tough, durable fragments of stone, crushed gravel, or a combination of both, as specified herein, and shall be of a uniform quality throughout free from dirt, organic or other injurious matter occurring either freely in the material or as a coating of the aggregate. The coarse aggregate shall have a maximum percent abrasion of 40 when subjected to the Los Angeles Abrasion Test (Tex-410-A) and a maximum percent loss of 30 when subjected to the 5 cycle Magnesium Sulfate Soundness Test (Tex-411-A).
 2. Fine Aggregate: The fine aggregate shall be that part of the aggregate passing the No. 10 sieve and consist of sand and fine aggregate particles from the coarse aggregates' material sources or a combination thereof. The sand shall be composed of durable particles free from injurious foreign matter and shall be limited to 15% of the total fine aggregate. Screenings shall be of the same or similar materials as specified for coarse aggregates. The plasticity index of that passing the No. 40 sieve shall be a maximum 6 when tested by AASHTO T-89 and T-90. Unless otherwise shown on the Drawings, stone screenings are required and shall be the result of a rock crushing operation and meet the following gradation requirements, when tested in accordance with Test Method Tex-200-F, Part I.

	Percent by Weight
Passing the 3/8" sieve	100
Passing the No. 10 sieve	70-100
Passing the No. 200 sieve	0-15

3. Mineral Filler: The mineral filler shall consist of thoroughly dry stone dust, portland cement, fly ash or other mineral dust approved by ENGINEER. The mineral filler shall be free from foreign and other injurious matter. The mineral filler shall meet the following grading requirements when testing in accordance with Tex-200-F, unless the Drawings show otherwise:

	Percent by Weight
Passing a No. 30 sieve	95 to 100
Passing a No. 80 sieve, not less than	75
Passing a No. 200 sieve, not less than	55

- B. Asphalt: Furnish performance-graded (PG) binders as shown on the drawings that meet the requirements of Item 300 "Asphalts, Oils, and Emulsions." If more than one type of asphaltic concrete mixture is specified for the project, only one grade of asphalt will be required for all types of mixtures.

1. Asphalt material for the prime coat shall be MC-30 or EAP&T and asphalt material for the tack coat shall be RC-250 or SS-1.
2. All prime coat or tack coat materials shall be obtained from TxDOT pretested stock.

- C. Hot-Mix Asphalt Concrete:

1. Design Mixes. After being tested in accordance with these specifications and current Texas Department of Transportation methods, the design mixes and materials are subject to approval of ENGINEER. Design mixes and density and stability tests are CONTRACTOR's responsibility and made at his expense. All certified test results, stating compliance with the specified requirements, for both the asphaltic materials and aggregates shall be furnished to ENGINEER.
2. Density and Stability Requirements. Laboratory density and stability of the mixture shall be designed and tested in accordance with the methods outlined in the Texas Department of Transportation C-14 and meet the following:

Density %		Optimum	Stability % Not Less Than
Min.	Max.		
95	99	96	35

The compacted thickness of the mixture(s) used shall be specified on the Drawings.

3. Hot-Mix Asphaltic Concrete Base Course—Type "B"

MASTER GRADING REQUIREMENTS FOR THE AGGREGATES

Sieve Sizes	Total Percent Passing, by Weight
1 1/2 inch	---
1 1/4 inch	---
1-inch	100%

Sieve Sizes	Total Percent Passing, by Weight
7/8-inch	95–100%
5/8-inch	75–95%
1/2-inch	---
3/8-inch	60–80%
1/4-inch	---
No. 4	40–60%
No. 10	27–40%
No. 40	10–25%
No. 80	3–13%
No. 200	1–6%*
VMA % Minimum	12

* 2–8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

The asphaltic material shall form three percent (3%) to eight percent (8%) of the mixture by weight.

4. Hot-Mix Asphaltic Concrete Surface Course–Type “D”

MASTER GRADING REQUIREMENTS FOR THE AGGREGATES

Sieve Sizes	Total Percent Passing, by Weight
1 1/2-inch	---
1 1/4-inch	---
1-inch	---
7/8-inch	---
5/8-inch	---
1/2-inch	100%
3/8-inch	85–100%
1/4-inch	---
No. 4	50–70%
No. 10	32–42%
No. 40	11–26%
No. 80	4–14%
No. 200	1–6%*
VMA % Minimum	14

* 2-8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

The asphaltic material shall form four percent (4%) to eight percent (8%) of the mixture by weight.

- D. Type of Plant: Mixing plants must have the capacity for producing mixtures that meet the specifications. Continuous mixing type and weight batching-type are both acceptable. The plant must have acceptable conveyors, power units, aggregate handling equipment, hot aggregate screens and bins, and dust collectors. The plant must provide equipment to adequately supply materials in accordance with the plant's rated capacity and produce finished material within the specified tolerances. Essential equipment includes cold

aggregate bins and proportioning device, dryer, screens, aggregate weight box and batching scales, mixer, asphalt storage and heating devices, and asphalt measuring devices.

2.03 FABRICATION

- A. Screening and Proportioning: Screening capacity and bin sizes shall be adequate to screen and store the amount of aggregate required to properly operate and keep the plant in continuous operation at full capacity.
- B. Drying: The mineral aggregate drying shall be done in a manner such that fine particles will not be lost with the furnace gases. A dust collector system will be required if forced draft is used. ENGINEER may require that a dust collector system be used during forced draft if a substantial amount of the finer particles are escaping. The aggregate shall be continuously agitated during heating in a suitable apparatus in which the temperature can be efficiently controlled so that the aggregate will not be damaged, and the finished mixture will have a temperature of between 250°F and 375°F. A recording thermometer shall be used to record the temperature of the aggregate as it leaves the dryer. The temperature record shall be a 24 hour chart and may be equipped to record both the temperature of the rock and the temperature of the aggregate incorporated into the batch. The dryer(s) shall be of adequate size to heat and dry the required amount of aggregate to keep the plant in continuous operation.
- C. Weigh Box: Tight cut-off gates shall be provided on the storage bins so that mineral aggregates will not leak into the weigh box. The weigh box shall be of a sufficient capacity to hold a complete batch of aggregate without wasting or leveling by hand. The weigh box shall be designed so that the entire batch will quickly discharge into the mixer. The weigh box shall have an open top so that any excess of one size of mineral aggregate may be removed by the operator, during charging. The weigh box shall have a close fitting and quick operating cut-off gate so that no mineral aggregate will leak into the mixer.
- D. Scales: Either the springless dial type or the multibeam-type scales may be used for weighing the different grades of mineral aggregate. If using a springless dial type, an adjustable indicating pointer shall be required for each grade of the mineral aggregate allowing for an accurate setting of the weight. If using a multibeam-type, there shall be sufficient weighing beams to weigh each grade of aggregate separately. All scales shall have a tare beam for balancing. The beam scale is also required to be equipped with a tell-tale dial indicator of the springless dial type indicating over and under load of at least 50 pounds. Scales that are not accurate within 4 pounds per 1,000 pounds net load will not be considered adequate. The scales shall be insulated against shock or vibration so that neither case shall interfere with accurate weighing.
- E. Mixing:
 - 1. The mixer shall be the twin-pug-mill type and shall have a capacity of not less than 2,000 pounds in a single batch. The positioning and number of blades shall be sufficient to give a uniform and complete circulation of the batch in the mixer from the center to the four ends of the mixer arms and then back to the center. A mixer will be considered inadequate if it fails to perform a uniform and thorough mixing with the asphalt cement and the aggregate, or it has a tendency to segregate mineral aggregate. Mixer determination will be made by mixing a standard batch for the required time, and then dumping out the batch in order to take samples from different parts of the batch for testing.

2. All mixers shall be provided with automatic time locks on the discharge gates and weigh box and will be locked for a period of 45 seconds after all of the mineral aggregate have been introduced into the mixer. The mixture shall have a temperature of 300°F to 375°F when discharged. The mixer dump door shall be tight to the dry mineral aggregate or dust so that there will be no spilling from the pug mill. All mineral aggregate shall be thoroughly mixed for a period of 5 to 10 seconds before the asphalt cement is added. Mixing will then continue for the required time, or longer if necessary to produce a mixture with uniform consistency.
- F. Heating and Weighing Asphalt:
1. Storage for the asphalt cement shall be adequate to meet the requirements of the Drawings. Asphalt cement in storage shall be heated by steam coils, tight enough to prevent moisture from leaking into the asphalt. Steam for heating shall not be at a temperature in excess of 400°F. Direct fire heating of asphalt shall not be permitted.
 2. The steam heating system shall provide a uniform draw-off heat of the asphalt cement is maintained between 250°F and 350°F at the asphalt cement bucket. The temperature shall be maintained with an efficient and positive control of the heat beyond 250°F, either before or during mixing with the mineral aggregate.
 3. The asphalt cement draw-off valve shall be of a quick cutoff type that will not leak any asphalt into the bucket after the required weight of the asphalt cement has been drawn. The asphalt supply line must be of a circulating type and must be equipped with a recording thermometer indicating the temperature of the asphalt at the draw-off valve. The recording thermometer may be a combination thermometer used for recording the temperature of the aggregate.
 4. The asphalt cement shall flow from the asphalt cement weigh bucket into the mixer for approximately the full width of the mixer so as not to deposit the asphalt cement in the mixer in one place. Scales used for weighing the asphaltic cement shall be of springless dial type arranged for quick adjustment at zero to provide for the change in tare. A pointer will indicate the weight of the asphaltic cement required in one batch.

PART 3-EXECUTION

3.01 PREPARATION

- A. Prior to placing any pavement, manhole frames and covers, valve boxes, and other such utility access structures shall be adjusted in elevation by CONTRACTOR if needed to match the surface of the new pavement. For overlaying existing pavement, cast iron or ductile iron extensions rated for not less than H-20 loading shall be used. For other than overlaying of existing pavement, CONTRACTOR shall adjust the height of manhole frames and covers, valve boxes, and other such utility access in a manner acceptable to ENGINEER to the grades required for the new pavement.
- B. The base course or asphalt course to be overlayed shall be cleaned by sweeping or other methods. All vegetation shall be removed from the area to receive the surface treatment. If a prepared base is to receive the new surface, it shall be lightly sprinkled immediately before the prime coat is applied. All rate of application and pressure gauges will be reviewed and calibrated prior to applying the prime coat. On new roadways where extended periods of traffic shut down is possible MC-30 prime coat shall be applied at a rate of 0.30 gallons per square yard at a temperature between 70°F and 150°F. On roadways unable to be shut down from traffic, emulsified asphalt prime and tack (EAP&T) shall be applied as the prime coat at a rate of 0.17 gallons per square yard. The prime coat shall dry for a period of

48 hours or longer if requested by ENGINEER. The prime coat shall be applied in strict accordance with the requirements of Item 310 of the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges.

3.02 ERECTION/ INSTALLATION/ APPLICATION AND/OR CONSTRUCTION

A. Laying:

1. The asphaltic concrete mixture shall be hauled to the worksite in vehicles cleaned of all foreign materials and covered with a canvas that is sufficient to protect the entire load. The vehicle dispatching shall be arranged so that all material delivered may be placed and initially rolled in the daylight. The mixture shall be deposited directly into the "lay down" machine or placed on the prepared base in windrows which will be spread to the line, grade and crown as specified in the Drawings. Transfer of mixture from dispatching vehicle to "lay down" machine using front end loaders or other equipment shall not be allowed unless specifically acceptable to ENGINEER. The mixture shall be spread without segregation or tearing. The mixture must be at a temperature between 200°F and 350°F.
2. The base course shall be spread in one lift so that when compacted, the finished course will be smooth, of uniform density, and will be to section, line and grades as requested.
3. A surface course of 2 inches or less in thickness may be spread in one lift. All lifts shall be spread such that when compacted, the finished course will be smooth, of uniform density, and will be to section, line and grades.
4. Asphalt base and surface courses may be spread and finished by hand if use of a paver is impractical. Steel or wood forms, rigidly supported to provide correct grade and cross-section, shall be used. Place the materials carefully in order to avoid segregation of the mix. Broadcasting of the material shall not be permitted. Any lumps which do not break down must be removed. Asphalt courses must be put down in the same sequence as if placed by machine.

B. Rolling: Rolling equipment shall consist of pneumatic tire and steel wheel rollers.

1. Pneumatic tire rollers shall have equal size and diameter pneumatic tires that are capable of exerting a contact pressure varying from 40 to 110 psi by adjusting ballast and/or tire pressure. Wheel spacing will be such that one pass will accomplish one complete coverage equal to the width of the roller and have a 1/4-inch minimum overlap. None of the wheels shall wobble. The tire pressure and operating weight shall be sufficient to achieve the desired density. The roller shall be self-propelled.
2. Steel wheel rollers shall be a three wheel roller two-axle tandem roller or three-axle tandem roller weighing not less than 8 tons and developing a compression in the rear wheels of 250 to 350 pounds per inch of roller width. The rollers shall have power units and be equipped with the means of keeping the wheel wet to prevent the mixes from sticking to the rollers. The rollers shall also be equipped with scrapers to keep the wheels clean.
3. Rolling shall start at the sides longitudinally and proceed toward the center of the pavement, overlapping on successive trips by at least 1/2 of the width of the rear wheels. Alternate trips of the roller shall be slightly different in length. Continue rolling until no further compression can be obtained and all roller marks are eliminated. The roller motion shall be slow enough so that there is no displacement of the hot mixture. The roller must not sit on completed pavement which has not cooled to the normal atmospheric temperature. The wheels shall be properly moistened with water to prevent the hot mixture from sticking to the rollers, but an excess of water shall not be permitted.

4. If the asphalt is not being compacted properly, in the opinion of ENGINEER, then cores will be taken and tested in order to determine the relative densities of the course at various locations.
 5. The completed course shall have a uniform density over the entire roadway area. ENGINEER may, after testing under acceptable practices, have all or parts of the course removed and replaced on areas where the density is found to vary. The task of removing and replacing of the course because of unacceptable density variations shall be completed at the cost of CONTRACTOR.
- C. Hand Tamping: In areas where compaction by a roller is not easily accomplished, such as along walls, curbs, headers, etc., a vibrating plate compactor or lightly oiled tamps shall be used to thoroughly compact the mixture in 3-inch layers.
- D. Density: The base course, binder course and surface course shall be compacted to a minimum density of 95 percent of the maximum possible density of a voidless mixture composed of the same materials in like proportions. If the results of the density tests for the base course, binder course or surface course indicate that the minimum density of 95 percent has not been obtained, additional rolling with a three-wheel or pneumatic roller will be required before the mix cools.
- E. Surface Requirements: The finished surface of plane areas shall not vary more than 1/4-inch from a 16-foot straight edge applied to the surface. The straight edge must overlap the previous test by 1/4 of its length. Any irregularities which vary more than 3/16-inch in 10 feet or 1/4-inch in 16 feet in accordance with the grade, valley and crown shown on the Drawings shall be corrected.
- F. Construction Joints: Each course shall be placed as nearly continuous as possible. The roller shall only pass over the unprotected end of the freshly laid mixture when the laying of the course is discontinued for such a length of time as to allow for the mixture to become chilled. In such cases, when the work is resumed, the material laid shall be either cut back in order to obtain a beveled edge for the full thickness of the course or an acceptable lap joint shall be made.
- G. No portion of the finished asphalt course shall be opened to traffic until 12 hours after rolling has been completed, except where shown on the Drawings or in an emergency.

3.03 REPAIR/RESTORATION

- A. Pavement sections not meeting the specified densities shall be recompact or replaced with new asphaltic concrete material. Pavement not having an acceptable surface course texture, not meeting surface test requirements or not meeting the minimum thickness shall be replaced with new material sections of surface course.

3.04 FIELD QUALITY CONTROL

- A. Extraction Test: The percentage of bitumen in any mixture shall not vary more than 1/2 of one percent from the proportion established by ENGINEER. Samples of the hot mixture may be taken from the trucks or from the finished pavement, when requested by ENGINEER. The minimum weight of the test specimen in grams shall be determined by multiplying 3,000 by the maximum size aggregate in inches; and when tested by standard laboratory methods (in which benzol may be used as the solvent), it shall not vary from the grading proportions specified, according to the mix being tested, by more than five percent in any particular case.

- B. Cores may be taken from the finished hot-mix asphalt concrete. The quality and thickness of the cores will govern the acceptance of the pavement.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVEMENT

PART 1–GENERAL

1.01 SUMMARY

- A. This section describes the furnishing and installing of a surface for pavement consisting of cement concrete pavement. Paving construction will be on stabilized subgrades and/or base to conform with the lines, grades, compaction thickness and the typical cross sections as shown on the Drawings.

1.02 MEASUREMENT AND PAYMENT

- A. The work performed and materials furnished for concrete pavement shall be measured and paid for by the square yard or linear foot of trench at the Unit Price Bid for concrete pavement meeting the minimum thickness required. The Unit Price Bid will be complete compensation for all equipment, materials, labor, and supervision required to construct concrete surface course as shown on the Drawings and for all equipment, materials, labor, and supervision required to adjust the elevation of manhole frames and covers, valve boxes, and other such utility access structures.

1.03 REFERENCES

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. TxDOT–Texas Department of Transportation Construction Bulletin No. 14.
 - 2. TxDOT–Texas Department of Transportation–Standard Specifications For Construction and Maintenance of Highways, Streets and Bridges.

1.04 QUALITY ASSURANCE

- A. It shall be the responsibility of CONTRACTOR to produce concrete pavement of the strength, durability, workability and specified finished; furnish representative materials for specimens in quantities required by the testing laboratory; take samples of materials for testing; check proportions of mix and immediately notify ENGINEER if proportions appear improper in any respect. CONTRACTOR shall comply with all testing laboratory findings and ENGINEER's decisions in reference to these findings.

PART 2–PRODUCTS

2.01 MANUFACTURERS

- A. The materials must be approved by ENGINEER prior to the delivery of any materials.

2.02 MATERIALS AND/OR EQUIPMENT

- A. Materials shall be as specified within Item 360 Concrete Pavement, 2. Materials, of the Standard Specifications.

- B. Expansion Joints. In addition to dowels, provide the following material for expansion joints:
 - 1. Joint Filler Material. Filler material shall be preformed expansion joint filler of the bituminous type which conforms to the requirements of ASTM D1751. Unless otherwise shown on the Drawings, the thickness of the filler material shall be 3/4-inch.
 - 2. Joint Sealing Compound. Joint sealing compound shall conform to the requirements of TxDOT Item No. 713.
 - 3. Backer Rods and Backing Materials. Provide a compressible type material such as closed-cell, resilient foam or sponge rubber stock of vinyl, butyl or neoprene, or expanded polyethylene or polyurethane. The diameter of the backer rod shall be at least twenty-five (25) percent larger than the joint reservoir and shall be capable of holding the fluid joint sealing compound in open joint in place. Backer rods shall be of such a type that it will not bond to the joint sealing compound.
 - 4. Sleeves. Sleeves for expansion joints shall be 26-gauge steel or PVC tubes which are capped at one end. Sleeves shall be in accordance with ASTM A120.
- C. Equipment shall be as specified within Item 360 Concrete Pavement, 3. Equipment, of the Standard Specifications.

PART 3-EXECUTION

3.01 CONSTRUCTION

- A. Installation and quality control shall be as specified within Item 360 Concrete Pavement, 4. Construction of the Standard Specifications.
- B. Placing of reinforcing steel shall be in accordance with the Drawings.
- C. Finishing:
 - 1. Concrete Pavement Finish: The pavement shall be struck-off and consolidated with mechanical finishing machines or by hand-finishing methods. Associated concrete curbs shall be given the same finish as the concrete pavement.
 - 2. Mechanical Finish: Texturing equipment shall be per TXDOT Item 360.
- D. Joints: All joints shall be as shown on the Drawings and shall be constructed in accordance with TxDOT, Item No. 360.
- E. Opening to Traffic: CONTRACTOR shall erect and maintain barricades to keep public and construction traffic from traveling on the newly placed concrete pavement. Prior to allowing traffic on the pavement, all joints shall first be sealed, the pavement cleaned, and earth placed against the pavement edges. If acceptable to ENGINEER, traffic will be allowed on the pavement after the concrete has been in place for 10 days but will be limited to vehicles with a gross weight of 14,000 pounds or less. After 14 days, if acceptable to ENGINEER, the pavement shall be opened to all traffic except any equipment not licensed for operation on public highways. The opening of the pavement to traffic shall in no way relieve CONTRACTOR from their responsibilities for the work as stated in the Contract and any Conditions thereto.

END OF SECTION

SECTION 32 92 19

SEEDING AND SODDING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Preparation of subsoil.
 - 2. Topsoil.
 - 3. Seeding, sodding, mulching or erosion mat, and fertilizing.
 - 4. Maintenance.
- B. Except for paved, riprapped, or built-up areas, all areas of the site which are disturbed, and areas noted on the drawings shall be seeded or sodded. Prior to seeding or sodding, disturbed areas shall be graded to subgrade for placement of topsoil. Surfaces on 3-to-1 slope or less may either be seeded or sodded, but surfaces on greater than 3-to-1 slope shall be sodded.
- C. CONTRACTOR shall proceed with restoration of property and cleanup of all disturbed areas concurrently with the installation of utilities and street construction.
- D. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 MEASUREMENT AND PAYMENT

- A. Payment: Payment for topsoil, seeding, fertilizer, mulching, erosion mat, and maintenance of restored areas shall be included in the lump sum bid. One percent of the total Contract price shall be retained following project completion until a uniform 2-inch growth of vegetation is established over all restored areas.

1.03 REFERENCES

- A. FS O-F-241—Fertilizers, Mixed, Commercial.
- B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the, State of Texas Department of Transportation, Standard Specifications for Construction and Maintenance of Highways, Latest Edition Items 160, 162, 164, 166, and 168, including all issued supplemental specifications and special provisions.

1.04 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Sod: Minimum age of 18 months, with root development that will support its own weight without tearing when suspended vertically by holding the upper two corners. Submit sod certification for grass species and location of sod source.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration. Do not deliver more sod than can be laid within 24 hours.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2-PRODUCTS

2.01 SEED MIXTURE

- A. Seed materials shall conform to TxDOT Item 164.
- B. Weed content shall not exceed 0.5% in mixture.

2.02 SOD

- A. Sod materials shall conform to TxDOT Item 162.

2.03 SOIL MATERIALS

- A. Topsoil shall consist of salvaged topsoil or hauled-in topsoil in accordance with Item 160 of the Standard Specification.
- B. Engineered Soil: Bioretention Basins require overexcavation, decompaction, and reconstruction with 24 inches of engineered soil except where noted otherwise.

2.04 ACCESSORIES

- A. Mulching material shall conform to TxDOT Items 162 and 164 of the Standard Specifications.
- B. Fertilizer materials shall conform to TxDOT Item 166 of the Standard Specifications and shall consist of the following proportions: Nitrogen 12%, phosphoric acid 12%, soluble potash 12%. Submit composition deviations to suit site conditions for ENGINEER's review.
- C. Water shall be clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.
- D. CONTRACTOR shall be responsible for watering in accordance with TxDOT Item 168 of the Standard Specifications.

PART 3–EXECUTION

3.01 GENERAL

- A. CONTRACTOR shall proceed with restoration of property and cleanup of all disturbed areas concurrently with the installation of utilities and street construction.

3.02 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.03 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil in accordance with local, state, and federal regulations.
- C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed. Repeat deep (> 12 inches) subsoiling or cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.04 PLACING TOPSOIL

- A. Place topsoil in accordance with TxDOT Item 160 of the Standard Specifications.
- B. Spread topsoil to a minimum depth of 6 inches over area to be seeded. Rake until smooth.
- C. Place topsoil during dry weather and on dry unfrozen subgrade.
- D. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.
- E. Grade topsoil to eliminate rough, low or soft areas, and to provide positive drainage.
- F. Manually spread topsoil around trees, plants, and buildings to prevent damage.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.05 FERTILIZING

- A. Apply fertilizer in accordance with TxDOT Item 166 of the Standard Specifications.
- B. Apply fertilizer after smooth raking of topsoil and prior to installation of seed or sod, no more than 18 hours before seeding or 48 hours before sodding.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.06 SEEDING

- A. Apply seeding in accordance with TxDOT Item 164 of the Standard Specifications. Apply evenly in two intersecting directions. Rake in lightly or roll the seeded area after seeding.
- B. Planting season shall be between February 1 and May 15, or between September 1 and November 30.
- C. Do not sow immediately following rain, when ground is too dry or during windy periods.
- D. Seeding shall be maintained by CONTRACTOR until grass is well established. Grass is well established when it covers the entire seeded areas to a height of 2 inches.
- E. Place erosion control mats per Section 31 25 00—Slope Protection and Erosion Control.

3.07 LAYING SOD

- A. Place sod in accordance with TxDOT Item 162 of the Standard Specifications.
- B. Moisten prepared surface immediately prior to laying sod.
- C. Lay sod immediately after delivery to site to prevent deterioration.
- D. Lay sod tight with no open joints visible and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- E. Lay smooth. Align with adjoining grass areas.
- F. On slopes 4-to-1 and steeper, sod shall be secured with wooden pegs at a maximum of 24 inches on center.
- G. On slopes 2-to-1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- H. All sod placed in ditches, flumes, or other appurtenances where a concentrated flow of water may be expected shall be staked regardless of the slope.
- I. Water sodded areas immediately after installation. Saturate sod to 4-inch depth of soil.
- J. All sodded areas shall be kept thoroughly moist until the sod is established. Sod that dies during correction period shall be replaced at no cost to OWNER.

3.08 MAINTENANCE

- A. Seeding or sodding shall proceed concurrently with the main construction. Seeding or sodding shall be maintained by CONTRACTOR until grass is well established. Grass is well established when it covers the entire seeded areas to a height of 2 inches.

END OF SECTION

SECTION 33 00 10

BURIED PIPING AND APPURTENANCES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All underground piping, valves, and appurtenances of every description.
 - 2. Excavation, dewatering, and backfilling for all work under this section unless otherwise noted.
 - 3. Concrete foundations and anchor bolts for all equipment furnished under this section.
 - 4. Underground piping connections to all equipment, whether furnished under this section or not.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCED SPECIFICATIONS

- A. Texas Commission on Environmental Quality, Title 30 Texas Administration Code (30 TAC), Chapter 290, Rules and Regulations for Public Water Systems and 30 TAC, Chapter 217, Design Criteria for Systems and Processes.
- B. Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

1.03 CODES AND STANDARDS

- A. Comply with the requirements of:
 - 1. The Railroad Commission of Texas Pipeline Safety Rules and applicable standard(s).
 - 2. NFPA 54—National Fuel Gas Code (Current Edition).
 - 3. Polyethylene gas distribution piping shall be installed in accordance with CFR 49, Part 192, Subpart G (mains), Subpart H (service lines), applicable codes and regulations, and ASTM D2774.
- B. Before any polyethylene fusion welding is performed, CONTRACTOR shall submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.
- C. ENGINEER and OWNER reserve the right to test the work of any welder employed on the project, at CONTRACTOR's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

1.04 SUBMITTALS

- A. Shop Drawings: General arrangement drawings of 3 inches or larger exterior (belowground) ductile iron, stainless steel and welded steel piping shall be submitted to ENGINEER for approval. Drawings shall include proposed materials, length, location, and elevation of pipe, fittings, pipe restraint, valves, and appurtenances.

1.05 MEASUREMENT AND PAYMENT

- A. All piping shall be paid for by the linear foot. Open cut and trenchless installation methods shall be paid for separately. Steel casing pipe will be paid for by the linear foot and shall include the cost of the carrier pipe, unless otherwise indicated on the bid form.
- B. All fittings and pipe appurtenances will be considered incidental to the installation of the pipe.
- C. Manholes will be measured on an each basis for each manhole up to a depth of 6 feet. The cost of all appurtenances will be included in the costs to install a manhole. Additional depth beyond 6 feet will be paid for on a vertical foot basis unless otherwise indicated on the bid form.

PART 2-PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

- A. All materials used in the manufacture, assembly, and painting of piping and valves in contact with water shall be compatible with potable water supplies and in contact with chemical feed systems shall be compatible with the chemicals being used. All glues, solvents, solders, etc., shall likewise be compatible. For instance, no lead-base solders shall be used. All materials in contact with water to be used for potable water supplies shall be National Sanitation Foundation (NSF)-approved.
- B. Size and Type:
 - 1. All materials shall conform to the size and type shown on the Drawings or called for in the specifications.
 - 2. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event standard fittings are not available, the method of joining shall be standard selected by CONTRACTOR and submitted for review by ENGINEER.
- C. Materials provided shall be suitable for the conditions in which they are being installed and used. CONTRACTOR shall review installation requirements of the Contract with material suppliers and incorporate any additional installation requirements necessary to meet the required use within the price bid for the Work.
- D. All pipe and materials used in performance of the Work shall be clearly marked as to strength, class, or grade. Pipe and materials not so marked shall be subject to rejection.
- E. When requested by ENGINEER, material suppliers shall furnish certificates of compliance indicating that all tests required by various Standards have been conducted and that the test results comply with the Standards.
- F. Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be selected by CONTRACTOR and submitted for review by ENGINEER.

2.02 MANHOLES AND UNDERGROUND UTILITY STRUCTURES

- A. General: All other provisions shown in the Drawings, except those contrary to provisions delineated herein or on the Drawings shall apply to manholes.
- B. Unless otherwise specified or shown on the Drawings for special manholes, all manholes shall be reinforced concrete precast manholes. Reinforced concrete manhole base sections, riser sections, cones, and flat slabs shall conform to the requirements of ASTM C478. Solid precast manhole bottoms shall be provided except where shown on the Drawings. Manholes shall be provided with minimum diameters as shown on the Drawings.
- C. A concrete water proofing admixture with red dye shall be added to each manhole during the concrete batching process and shall be Xypex Admix C-1000 Red dosed at 20 pounds per cubic yard of concrete, Krypton KIM-HS (K301) dosed at 2% by weight of cementitious materials, including fly ash, Penetron Admix RP dosed at the rate of one 6.6 pound soluble bag per cubic yard of concrete, or equal.
- D. Manhole top sections shall be precast reinforced concentric cones unless precast reinforced flat slabs are specifically required or shown on the Drawings or are necessary because of shallow depth. Flat slabs shall have opening offset unless otherwise required or shown. Flat slabs shall be designed for HS20 loadings.
- E. Reinforced fiberglass plastic shall be as manufactured by Containment Solutions, Inc., or equal. A traffic model designed for H 20 wheel loading is required. The base (bottom) of the manhole shall be pre-cast concrete meeting the requirements in these specifications for pre-cast concrete manholes and as shown on the Drawings.
- F. Manhole Chimney Adjusting Rings:
 - 1. Provide concrete manhole adjusting rings.
 - 2. Precast concrete adjusting rings for standard manholes shall have an inside diameter of 30 inches, be not less than 2 inches nor more than 6 inches high and shall have a wall thickness of 6 inches unless otherwise specified. The rings shall contain a minimum of one No. 2 reinforcing rod centered within the ring. The joints between rings and between rings and castings shall be sealed with preformed flexible joint sealant as specified herein.
 - 3. CONTRACTOR shall have all ring sizes available when rebuilding tops of manholes, including tapered sections to allow for seamless adjusting of frame elevations on flat and sloped surfaces.
 - 4. Concrete adjusting rings shall not be used for manhole adjustments. Substitute HDPE adjusting rings for concrete rings.
- G. Frames and Covers: Refer to Section 02091–Non Metallic Frames and Covers.
- H. Manhole Chimney Seals:
 - 1. CONTRACTOR shall provide internal manhole frame chimney seal. The seal shall be made of a rubber type product, with a minimum thickness of 3/16 inches, a minimum unstretched width of 8 inches and be extruded or molded from a high-grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used for compressing the sleeve against the manhole shall be fabricated from stainless steel conforming to ASTM A240, Type 304, for sheet and ASTM A479, Type 304, for rods. Any screws, bolts, or nuts used on these bands shall be stainless steel conforming to ASTM F593 and F594, Type 304. The internal seal or its appurtenances

shall not extend far enough into the manhole opening to restrict entry into or exit from the manhole.

2. Manhole frame-chimney seals shall be designed to prevent the leakage of water into the manhole at the area of the joint between the manhole frame and chimney continuously throughout a 20-year design life. The seal shall remain flexible, allowing repeated vertical movements of the frame because of frost lift, ground movement, or other causes of up to 2 inches and/or repeated horizontal movements of the frame because of thermal movement of the pavement or other causes of up to 1/2 inch, both rates of movement occurring at rates not less than 0.10 inch per minute.
3. The seal shall be made of only materials that have been successfully used in sanitary sewer construction for at least 10 years and have proven to be resistant to sanitary sewage; corrosion or rotting under wet or dry conditions; the gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide and other trace gases at the sites of installations; the biological environment in soils and sanitary sewers; chemical attacks by road salts, road oil and common street spillages or solvents used in street construction or maintenance; the temperature ranges, variations and gradients in and between manhole frames and chimneys in the climate of the location of construction; variations in moisture conditions and humidity; fatigue failure caused by a minimum of 30 freeze thaw cycles per year; or vibrations because of traffic loadings; fatigue failure because of repeated variations of tensile, compressive and shear stresses and repeated elongation and compression; and any combination of the foregoing. The materials used shall be compatible with each other and the manhole materials.

I. Precast Reinforced Concrete Manholes:

1. Lengths of manhole riser (barrel) shall be furnished in such combinations as to conveniently make up the depth of the manhole. A maximum of two handling holes per length of riser will be permitted.
2. Drop entrances to sanitary sewer manholes shall be installed where indicated on the Drawings. Drop entrances shall be of the same diameter as the sewer main from sizes 8 inches through 18 inches. For larger diameters, the drop shall be 18 inches unless otherwise shown on the Drawings. Drop entrances for storm sewer manholes are not required.
3. The interior bottom of sanitary sewer and storm sewer manholes shall be constructed of concrete benches which shall be precast or poured in place in the field. Benches shall be constructed, at a minimum, to the spring line of pipe for diameters less than 15 inches and to 3/4-pipe-diameter for pipe diameters between 15 and 24 inches. Benches shall extend to the top of each pipe that is greater than 24 inches in diameter. Flow lines shall be made smooth with uniform curves to promote flow through the manhole.
4. All joints between manhole pipe sections and top shall be tongue and groove conforming to ASTM C443. Manhole joints for sanitary sewers shall use circular O-rings. Manhole joints for storm sewers shall be sealed with circular O-ring or preformed flexible joint sealant that shall be Ram-nek, Kent-Seal, Mas-stik, or equal.
5. Manhole connections for sanitary sewer mains shall be made using flexible, watertight connections, PSX Press Seal, Kor N Seal, or equal, for sewers up through 18-inch diameter. All other sanitary sewer manhole connections shall be made with A Lok, PSX Press Seal, Kor N Seal, or equal. The joint shall provide a flexible, watertight connection between pipe and manhole. Manhole connections for storm sewer mains and leads may be made with cast-in-place concrete during completion of manhole interior in lieu of above.

6. Manhole bottoms for sanitary sewer shall be monolithically precast with the bottom section for manholes up through 6-foot diameter. Bottoms for larger diameter manholes shall be precast but need not be monolithically cast with the bottom section. All other manhole bottoms shall be either poured in place or precast concrete.
 7. Manhole bottoms for air release manholes, force main cleanout manholes and water system valve manholes shall have an 18-inch diameter sump hole. Sump hole shall have a solid concrete bottom where groundwater is above the bottom of the manhole.
 8. Manholes shall be furnished of minimum diameters as shown on the Drawings. Manholes shall be furnished large enough to provide a minimum distance, between adjacent pipe, measured tangentially along the inside face of the manhole, equal to one half the outside diameter of the intersecting sewer pipe. In any event, manholes shall be furnished in the diameter necessary to accommodate intersecting sewer pipe and the pipe to manhole connection as proposed for use.
 9. Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497. Precast reinforced concrete manhole risers and tops meeting the strength requirements will be considered acceptable and shall be stamped with an appropriate monogram. When requested, copies of test reports shall be submitted to ENGINEER before the manhole sections are installed in the Project. Final acceptance will be made after field inspection upon delivery to the jobsite.
 10. Precast reinforced concrete manhole sections shall be subject to rejection for failure to conform to any of the requirements of the Standard Specifications. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:
 - a. Fracture or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
 - b. Defects that indicate imperfect proportioning, mixing, and molding.
 - c. Surface defects indicating honey combed or open texture.
 - d. Damaged ends, where such damage would prevent making a satisfactory joint.
 - e. Noticeable infiltration into manhole.
 - f. Variation in diameter of the manhole section of more than 1% from the nominal diameter.
 - g. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more regardless of position in the section wall.
- J. Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted thereon with waterproof paint.
- K. Manhole and Inlet Castings
1. All manhole and inlet castings shall be gray iron and meet the requirements of ASTM A48. Unless otherwise shown on the Drawings, standard manhole castings shall be Neenah R1550 with machined frame, Type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal. Floodproof castings shall be Neenah R1916 C with machined frame, type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal.
 2. Inlet castings for locations with curb and gutter shall be Neenah R3067 with type L grates on slopes and type R grates at low points, East Jordan Iron Works, or equal. For driveway areas, inlet castings shall be Neenah R3290 with Type C grates, East Jordan Iron Works, or equal.
 3. Frames for valve manholes shall be Neenah R-6065 with Type B lid, R-5900-F with Type C lid with two concealed pickholes equipped with self-sealing gaskets, or equal.

Catch basin grates shall be Neenah R-1550 with machined frame and Type D open grate, or equal. Interior mud basin castings shall be Neenah R-6118, or equal, with grey iron Class 35 frame and grating for heavy-duty use.

- L. Mortar: Mortar shall meet the requirements of ASTM C270. Mortar shall be one part Portland cement and 2 1/4 parts washed mortar sand.
- M. Preformed Flexible Joint Sealant: Preformed flexible joint sealant shall be EZ Stik, Kent Seal, Ram Nek, or equal, meeting the requirements of ASTM C990.
- N. O-Rings: O-rings shall meet the requirements of ASTM C443.

2.03 BURIED PIPING

A. Solid Wall PVC:

1. Polyvinyl chloride (PVC) pipe shall meet the requirements of ASTM D3034 for pipe sizes 4 inches through 15 inches and ASTM F679 for pipe sizes 18 inches through 60 inches.
2. PVC material for ASTM D3034 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784 with minimum modulus of elasticity of 400,000 psi. Pipe stiffness shall be minimum 46 psi when tested in accordance with ASTM D2412. Pipe shall have a maximum standard dimension ratio (SDR) of 35.
3. PVC material for ASTM F679 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784 with a minimum modulus of elasticity of 500,000 psi. Pipe stiffness shall be a minimum 115 psi when tested in accordance with ASTM D2412.
4. Pipe and fittings shall be the product of one manufacturer, and the manufacturer shall have experience records substantiating acceptable performance of the pipe and fittings to be furnished. The minimum wall thickness of fittings shall be the same as the pipe to which it connects.
5. Acceptance of piping and fittings shall be subject to tests conducted in accordance with ASTM D3034 and/or ASTM F679.
6. Fittings such as saddles, elbows, tees, wyes, and others shall be of material and construction corresponding to and have a joint design compatible with the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe.
7. Joints shall be of the elastomeric type for pipes 4 inches or larger and elastomeric or solvent cement for pipes less than 4 inches.
8. Elastomeric joints shall be a bell and spigot joint conforming to ASTM D3212 sealed by a rubber gasket conforming to ASTM F477 so that the assembly will remain watertight under all conditions of service, including the movements resulting from the expansion, contraction, settlement, and deformation of the pipe. Bells shall be formed integrally with the pipe and shall contain a factory-installed positively restrained gasket.
9. Solvent cement joints shall be assembled using solvent cement obtained from the pipe manufacturer, which conforms to the requirements of ASTM D2564.
10. The assembled joint shall pass the performance tests as required in ASTM D3212.

B. Open Profile Wall PVC (18 Inches and Larger Pipe Only):

1. Open profile PVC pipe and fittings shall meet the requirements of ASTM F794. Fittings shall also conform to ASTM D3034 SDR 35. Pipe shall have smooth interior with a ribbed exterior. Exterior ribs shall be perpendicular to the axis of the pipe to allow placement of gaskets without additional cutting or matching. Pipe shall have solid wall cross section; no voids between inner and outer surfaces of pipe wall.

2. PVC materials shall have cell classification 12454 as defined in ASTM D1784 with minimum modulus of elasticity of 400,000 psi. Pipe stiffness shall be minimum 46 psi when tested in accordance with ASTM D2412. Impact strength shall equal or exceed values given in ASTM D3034 or F679.
3. Pipe and fittings shall be the product of one manufacturer and the manufacturer shall have an experience record substantiating acceptable performance of the pipe to be furnished. Fittings shall be injection molded.
4. All joints shall be of the flexible elastomeric type with bells and spigots conforming to ASTM D3212. Gaskets shall conform to ASTM F477. All bells shall be formed integrally with the pipe. Elastomeric gasket shall be positively restrained in ribs on spigot of pipe.
5. Acceptance of piping shall be subject to tests conducted by an approved testing agency in accordance with ASTM F794.
6. Fittings such as saddles, elbows, tees, wyes, and others shall be of material and construction corresponding to, and have a joint design compatible with, the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe. Fittings shall be molded.
7. Joints shall be sealed with elastomeric gaskets meeting the requirements of ASTM F477. Solvent cement shall not be used to join pipe lengths or fittings to pipe lengths. The assembled joint shall pass the performance tests as required in ASTM D3212.
8. The pipe wall will be homogeneous and contain no seams. Minimum pipe stiffness per ASTM D2412 shall be 60 psi for 18 inches and 46 psi for 21 inches and larger pipe sizes. Pipe shall withstand impact of 220 foot pounds. Standard lengths shall be 13 foot or 20 foot lengths. Pipe shall withstand flattening up to 60% without cracking, splitting, or breaking and pass acetone immersion in accordance with ASTM D2152.

C. Gravity Sanitary Sewer Service Branches and Laterals:

1. Branches (tees and wyes) shall be of the same material as the main.
2. If a different thermoplastic material is specified for laterals than for the main line, appropriate solvent welds, fittings, transition couplings, and other appurtenances shall be provided to effect a water tight seal.
3. Fittings for laterals shall be of the same material as the lateral pipe unless special fittings are needed for transition between material types or sizes, or standard fittings are not manufactured.
4. Where the wye or tee branches and laterals are of dissimilar materials, CONTRACTOR shall provide a transition coupling for the connection.
5. All fittings used, including type of jointing, are subject to review by ENGINEER.

D. PVC Pipe (AWWA) and PVC Pressure Pipe Fittings (4 Inches and Larger):

1. PVC water main shall be AWWA PVC pressure-rated pipe and shall conform to the requirements of AWWA C900 for pipe from 4 inches to 60. Pipe shall be furnished with integral elastomeric bell and spigot joints.
2. PVC pipe diameter shall conform to ductile iron pipe sizes (DIPS). The type of PVC material, nominal pipe size, standard dimension ratio, and pressure class shall be not less than pressure class 235 and not greater than pipe dimension ratio 18.
3. Markings on pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, AWWA Designation with which the pipe complies, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for transport of potable water.
4. All fittings for PVC pressure pipe shall be iron pipe fittings as specified herein.

5. Provide tracer wire for underground PVC piping as specified herein, unless otherwise noted.
- E. Transition Couplings for Gravity Sewer Service: Transition couplings shall be provided to join dissimilar pipe materials or to connect pipe where a standard pipe joint cannot be provided. Couplings shall be designed to join the pipe materials matching flow line elevations. Transition couplings for gravity sewer service shall be Fernco 5000 RC Strongback, Mission Flex Seal ARC Shielded, or equal. Shear rings shall be provided to minimize differential settlement. All bands, clamps, shear rings and other metal components shall be stainless steel. Bushings or transitions shall be provided to accommodate pipe size differences.
- F. Tracer Wire:
 1. Provide minimum 10-gauge solid insulated copper tracer wire with buried thermoplastic pressurized pipe. Wire shall be continuous, terminate, and be accessible at valve boxes, water meter boxes, manholes, fire hydrants, or at test stations as specified below. Tracer wire shall be located 12 inches above the top of the pipe. Any splices in copper wire shall be made with a 3M Dbv/Y-6 splice kit, or equal.
 2. Tracer wire test stations shall be SnakePit magnetized tracer boxes by Copperhead Industries, or equal. Tracer box shall be corrosion-resistant brass wire lugs and wax pad to cover wire connection. Cover shall be color-coded according to APWA standards for fluid conveyed. Provide SnakePit Lite Duty Box in unpaved areas and Roadway Box in paved areas. Provide Rhino Triview Marker Posts, or equal, at all test stations. Provide custom decals to identify fluid in piping. The tracer wire shall be accessible at a minimum of every 500 feet along the pipeline and at horizontal bends in piping. The tracer wire shall run into and up the sides of all manholes and be secured near the casting. Test stations shall be placed as required between manholes to comply with the minimum 500-foot tracer wire accessibility requirement.
 3. CONTRACTOR shall perform continuity testing of all tracer wire in the presence of OWNER.

2.04 AGGREGATE SLURRY (FLOWABLE) BACKFILL:

- A. Aggregate slurry (flowable) backfill shall consist of fine and coarse aggregate conforming to ASTM C33. Coarse aggregate shall be size number 67 and fine aggregate shall be size number 4. The material shall be mixed with water to provide an approximate 3-inch slump. The mix shall be deposited in the trench from ready-mix concrete transit mix trucks and shall be consolidated using concrete vibrators or vibratory plate compactors.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Underground Piping:
 1. Utility lines shall be laid and installed to the lines and grades specified with valves, fittings, manholes, and other appurtenances at the specified locations; spigots centered in bells; and all manholes and riser pipes plumb. Water main and force main shall be installed at the depth indicated. Gravity sewer mains and laterals shall maintain a minimum 48" feet of cover but shall be deep enough to provide service to buildings. Water main, force main, and other pressure mains shall be installed to within (plus or minus) 0.1 feet of designed grades. Sanitary and storm sewer and laterals shall be installed to within (plus or minus) 0.03 feet of designed grades.

Service lines shown on the Drawings are approximate. ENGINEER will assist CONTRACTOR in staking the actual locations in the field. Staking shall be completed in conformance with Division 01 of the Standard Specifications.

2. Deviations Occasioned by Underground Facilities: Wherever significant obstructions not shown on the Drawings are encountered during the progress of the Work, CONTRACTOR shall proceed in accordance with the General Conditions to notify owners and protect the facilities. Existing items unnecessarily damaged during the performance of the Work shall be repaired and replaced at the expense of CONTRACTOR.
3. Prior to commencing pipe laying, CONTRACTOR shall notify ENGINEER of the intended date for starting Work. ENGINEER may request at CONTRACTOR's expense the removal and relaying of pipe which was installed prior to notification of ENGINEER.
 - a. Proper implements, tools, and facilities shall be provided and used by CONTRACTOR for the safe and convenient prosecution of the Work. All pipe, fittings, and appurtenances shall be carefully lowered into the trench piece by piece with a crane, rope, or other suitable tools or equipment, in such manner as to prevent damage to materials. Under no circumstance shall pipe be dropped or rolled into the trench.
 - b. Materials shall be as shown on the Drawings or as specified herein.
4. Material Inspection: CONTRACTOR shall inspect the pipe, fittings, and appurtenances for defects when delivered to the jobsite and prior to lowering into the trench. Defective material shall be removed from the jobsite. All material shall be clean and free of deleterious substances prior to use in the Work.
5. Except where noted or specified, all ductile iron underground piping shall be laid in accordance with AWWA C605 with the conditions that (a) blocking shall not be used to support pipe and (b) all bends and fittings shall be restrained as specified below, and pipe joints shall be restrained in all directions from all bends and fittings to the length as specified below.
6. Pipe Length:
 - a. The minimum length of pipe to be restrained shall be as shown in the following table.
 - b. This table assumes horizontal orientation of fittings, 150 psi test pressure plus a 100 psi water hammer allowance, ductile iron pipe, and a 3-foot bury. Lengths shall be adjusted for other conditions and fittings. For other fittings and for more specific requirements, see the Drawings:

REQUIRED LENGTH OF RESTRAINED PIPE BEYOND FITTING IN FEET

Fitting	Minimum Length—Ft
90 Degree Bend (≤ 6 inches)	36
90 Degree Bend (8 inches to 10 inches)	54
90 Degree Bend (12 inches to 14 inches)	72
90 Degree Bend (16 inches)	84
45 Degree Bend (≤ 8 inches)	18
45 Degree Bend (10 inches to 16 inches)	36
22 1/2 Degree Bend ≤ 16 inches	18
11 1/4 Degree Bend ≤ 16 inches	9
Fire Hydrant Leads	All Joints
End of Line Tees (≤ 4 inches)*	18 (Along Branch)
End of Line Tees (6 inches to 8 inches)*	36 (Along Branch)

Fitting	Minimum Length—Ft
End of Line Tees (10 inches to 12 inches)*	54 (Along Branch)
End of Line Tees (14 inches to 16 inches)*	72 (Along Branch)

*Restrained run length on tees assumed 18 feet on each side of fitting.

7. Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
8. PVC sewer and plant drain piping shall be installed in accordance with ASTM D2321. Except where noted or specified, PVC or other thermoplastic pressure piping shall be installed in accordance with ASTM D2774.
9. Except where noted or specified, reinforced concrete pipe shall be installed in accordance with ASTM C12.
10. CONTRACTOR shall lay all gravity pipe to the line and grade shown on the Drawings with bell ends uphill wherever possible. If not possible, CONTRACTOR shall lay pipe to the line and grade shown on the Drawings with bell ends in the direction of laying. Water piping and chemical solution piping shall have a minimum of 3 feet of cover. Unless shown otherwise, drainage piping shall clear floor slabs or footings by a minimum of 6 inches.
11. Any pipe or fittings cracked in cutting or handling or otherwise not free from defects shall not be used. Pipe must be kept clean of mortar, cement, clay, sand, or other material. When PVC piping is installed during hot weather, it shall be laid in the trench with slack or permitted to cool to ground temperature before it is cut to length for making final connections. PVC expansion joints shall be provided where needed.
12. At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. Acceptable plugs include Foreman Nite Caps by APS, mechanical joint cap or plug, bladder plug, or test plug. All foreign material shall be removed from the pipe prior to acceptance.
13. The locations and elevations of existing piping and manholes are approximate. Where necessary, existing piping shall be exposed by CONTRACTOR to confirm location and elevation before installing new piping. Any changes in pipe location or elevation shall be approved by OWNER.
14. General Excavation:
 - a. Pipe Laying:
 - (1) All pipe shall be laid accurately to the line and grade as designated. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be joined or of the factory made jointing material shall be clean and dry. Lubricants, primers, adhesives, and other joint material shall be used and installed as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined, and adjusted in such a workmanlike manner as to obtain the degree of watertightness specified. Pertinent specifications from the joint and pipe manufacturer which outline procedures to be followed in making the joint shall be furnished to ENGINEER.
 - (2) Wyes, tees, and special fittings shall be installed as called for on the Drawings, or as requested by ENGINEER. Wyes, tees, and special fittings, shall, in general, be jointed with the same type of joint as used in the pipe.
 - (3) In joining two dissimilar types of pipe, manufactured adapters and fittings shall be used. Adapters and fittings shall be configured to maintain invert elevations at same level.

- (4) Joint deflections shall not exceed the limits established by the pipe manufacturer for the pipe and joint being used.
 - (5) Joints that are damaged because of carelessness, improper handling, or failure to prevent imperfections in manufacture shall be subject to rejection and gaskets shall be subject to rejection whenever they show surface cracking, tears, or splice separation.
 - (6) At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. All foreign material shall be removed from the pipe prior to acceptance.
 - (7) After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with specified backfill material tamped around it except at the bells.
 - (8) Pipe shall be brought home by using a cross member and levers or jacks. It will not be permissible to push pipe home with motor powered excavation equipment.
 - (9) Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
- b. Sewer Service Branch and Lateral Installation:
- (1) CONTRACTOR shall furnish and install sanitary sewer and storm sewer branches, laterals, and leads as shown on the Drawings or requested by ENGINEER. Under normal circumstances, service laterals will be installed within the right of way or easement to serve all existing buildings and all platted lots. In certain cases, only wye or tee branches will be installed to vacant lots. Service laterals shall consist of a branch fitting at the main and extension of the specified lateral pipe to the end of lateral as called for and requested. All necessary fittings shall be furnished and installed to complete the installation. All necessary fittings shall be furnished and installed to complete installation of for storm sewer leads.
 - (2) Wye or tee branches: Wherever shown on the Drawings or requested by ENGINEER, wye or tee branches shall be provided for use in making sanitary sewer service and storm sewer inlet connections. Unless specified otherwise on the Drawings, wye or tee branches for sanitary sewer service lateral connections to single family residences shall be 4-inch diameter. All other sanitary sewer service lateral connections shall be 6 inches. Wye or tee branches for storm sewer inlet connections shall be of the size called for on the Drawings, 12 inches minimum.
 - (3) Sanitary sewer service branches shall be turned so that the branch is at an angle of 30 degrees or 45 degrees from the horizontal.
 - (4) Sanitary Sewer Service Laterals: Under normal conditions and unless otherwise shown on the Drawings or requested by ENGINEER, all service laterals shall be Standard Laterals.
 - (5) It is the general intent to install Modified Laterals, Type 2, 4, or 5 for service to homes that presently have shallow or no basements or where the depth to groundwater at the end of lateral is shallow. Types 3 and 6 risers are only to be provided where shown on the Drawings.
 - (6) Installation and Testing Requirements: Except for those branches that are to be used on storm sewers or for extending sanitary sewer service laterals, wye and tee branches shall be closed with airtight stoppers blocked to withstand air test pressures.

- (7) The ends of all laterals shall be plugged and blocked to resist air test pressures. All plugs shall be manufactured to fit the pipe used and shall be watertight. The ends of all laterals shall be marked using flagging tape and 2 by 4 markers.
 - (8) Unless otherwise provided for in the Drawings, each service lateral shall have a tracer wire installed from the main to the property line or the location of the connection to the existing service, whichever is greater or applicable. The tracer wire shall be 10-gauge solid copper with no splices. The wire shall be secured to the pipe with duct tape at a minimum of 3-foot intervals. The ends of the tracer wire shall be brought to the ground surface and stored in an access terminal box, DWS–Tracer Wire Access Box, or equal, at a location selected by OWNER. Eighteen inches of additional wire length shall be coiled at the location of the terminal box. CONTRACTOR shall confirm the method of installation is compatible with OWNER's means of detecting the location of the service lateral. Each tracer wire shall be tested by CONTRACTOR to confirm it accurately provides the location and depth of the sewer lateral.
 - (9) A complete and accurate tabulation of length, depth, and location of all branches, risers, and laterals shall be kept by CONTRACTOR on cards available from ENGINEER. Measurements shall be made from the nearest downstream manhole. Lateral installation to meet these Standard Specifications and field conditions are the responsibility of CONTRACTOR. Problems occurring because of failure to provide proper installation or proper records shall be corrected by CONTRACTOR at its expense.
 - (10) No installed lateral shall be backfilled until ENGINEER has been notified that the lateral is complete and reasonable time is allowed for observation of the Work.
- c. Manholes:
- (1) Manholes shall be installed as shown on the Drawings for sewers. For sanitary sewers, openings shall be located over the bench and not the sewer flow line itself.
 - (2) All manholes shall be made watertight and shall show no visible signs of leakage at the time of final review and within the correction period. Any leakage shall be sealed from the exterior of the manhole.
- d. Abandoning Utilities: Utilities to be abandoned shall, unless otherwise noted on the Drawings, be abandoned in place. Open ends of pipes shall be filled with flowable fill and plugged with 12 inches of concrete. Manhole barrels, valve boxes and other such structures shall be removed to a point 3 feet below existing or final ground surface, whichever is lower, and shall then be filled with backfill material compacted to that of the trench backfill. An approximate 9-inch-diameter opening shall be made in the bottom of the structure to allow for groundwater movement.
- e. Connections to and Modifications of Structures and Mains:
- (1) Unless otherwise noted on the Drawings, openings in existing structures to allow for connection of mains shall be core drilled, and the mains themselves shall be connected by use of watertight connections as specified in the Standard Specifications. Flow channels in the bottoms of existing structures shall be modified as necessary to provide smooth transition for incoming flow and/or orientation of mains. These modifications may include breaking out and reforming flow channels.
 - (2) Where mains, new and existing, are to intersect, dog house manholes shall be provided to facilitate connection and to gain access to the intersecting mains. Manholes shall be provided at the manufacturing plant with arched

openings in lower barrel section to span each of the intersecting mains. Reinforcing shall be cut and bent back. In the field, manhole shall be set on concrete blocks, with reinforcing provided according to the Drawings for the bottom slab. Concrete shall be poured under and around the manhole to seal all openings, cover and adhere to the slab and bent reinforcement, and provide for benches or fillets in the manhole. Sanitary and storm sewer mains shall be kept intact until the bench or fillet is poured. Then the top of pipe to springline shall be removed to provide access.

15. Valve Boxes: The valve box shall be centered and plumb over the wrench nut of the valve with the box cover flush with the finished ground elevation. Solid 4-inch concrete blocks shall be placed under the base of valve boxes so that the bottom of the base is about 2 inches away from contact with the valve bonnet. The valve box shall not transmit shock or stress to the valve.
16. Trench drains, channel, and grates shall be installed according to manufacturer's requirements. Place minimum 4 inches of concrete beneath and on each side of channels.

3.02 FIELD QUALITY CONTROL

- A. CONTRACTOR shall include the cost of all televising, testing, cleaning, and disinfection in the price bid.
- B. Work shall be tested as specified in this section. Unless indicated in writing before testing begins, tests shall be witnessed by ENGINEER and others as necessary. Test results shall be recorded, and reports or appropriate certificates shall be submitted to ENGINEER in triplicate.
- C. New piping shall be tested. Prior to conducting the pressure and leakage test, CONTRACTOR shall backfill the trench for its full depth. All bends and special connections to the main shall be adequately blocked and tied prior to the test. Any damage caused to the main or its appurtenances during performance of these tests shall be corrected by CONTRACTOR at its expense. Should underground piping fail test, CONTRACTOR shall be responsible for removal and replacement of backfill, and relay new pipe if necessary, to repair the defective pipe. Under no circumstances shall defects be sealed from the interior of the pipe, and only where specifically allowed by ENGINEER, shall defects be sealed from the exterior of the pipe. Piping, interior or exposed, shall be subject to test before being covered with insulation or paint. Piping and appurtenances shall be watertight or airtight and free from visible leaks. Manholes and precast reinforced concrete wet wells and appurtenances shall be free of any visible leaks. Any leakage shall be sealed by methods acceptable to OWNER, from the exterior of the manhole or structure. Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497.
- D. Piping shall be flushed or blown out after installation prior to testing. CONTRACTOR shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials, and facilities necessary to complete the specified tests. CONTRACTOR shall provide all temporary sectionalizing devices and vents for testing.
- E. Pressure Tests:
 1. Pressure tests shall be performed as required by AWWA C600 and AWWA C605, unless otherwise noted herein.

2. When test medium for piping is water, all air shall be removed from piping by flushing, opening vents, loosening flanges, utilizing equipment vents and/or installation of corporations at high points in system. Test pumping equipment used shall be centrifugal pumps or other pumping equipment that will not place shock pressures on the main. Power plunger pumps will not be permitted for use on closed pipe systems. Pumps shall be disconnected during test periods. Presence or absence of air will be determined during pressurization of the piping system.
3. The test pressure in all lines shall be held for one hour during which time the leakage allowance shall not exceed that specified. In case repairs are required, the pressure test shall be repeated until the pipeline installation conforms to the specified requirements. Pumps, air compressors, instrumentation, and similar equipment shall not be subjected to the pressure tests. All piping conveying a combination of fluids, such as SCM/WAS, shall be tested at the higher test pressure.
4. During performance of the hydrostatic pressure test, water main shall be subjected to a minimum pressure of at least 25% above normal working pressure, at the highest point, with a minimum pressure 125 psi. Force main shall be tested to 200% of normal operating pressure in the main, but to no more than the pressure rating of the pipe.
5. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.
6. Where connections are made to existing mains, it shall be the responsibility of CONTRACTOR to provide the necessary hydrostatic tests on all new mains installed. This may necessitate, but is not limited to, the installation of temporary valves and restraint to isolate the new system from the existing system. All materials, Work, and equipment necessary for this Work shall be furnished by CONTRACTOR at its expense.
7. All testing of pipelines shall proceed concurrently with installation. CONTRACTOR is advised that it may be advantageous to conduct daily preliminary testing of its Work.
8. Water from disinfection testing shall not be discharged to a stream, creek, river, storm sewer tributary thereto, or to a navigable water without first neutralizing the chlorine residual in the water and complying with local, state, and federal laws thereto.
9. Gauges used for testing shall have increments as follows:
 - a. Tests requiring a pressure of 10 psi or less shall use a testing gauge having increments of 0.10 psi or less.
 - b. Tests requiring a pressure of greater than 10 psi by less than or equal to 100 psi shall use a testing gauge having increments of 1 psi or less.
 - c. Tests requiring a pressure of greater than 100 psi shall use a testing gauge having increments of 2 psi or less.

Fluid Abbreviation or Name	Minimum Test Pressure in psi	Test Medium	Leakage Allowance Designation
A	15, 25	Air	"B" ⁽²⁾
(CA)	150	Air	Zero
Chlorine Gas (CG), CDG, SDG, Under Pressure	300	Dry N ₂ Gas	Zero
Chlorine Gas (CG), CDG, SDG, Under Vacuum	15 inches Hg	Vacuum	Zero
CLS, SB, SBS, SDS, SH, SHS, HP, Odor Control Chemical	150	Water	"A" ⁽¹⁾
ML, PI, PRE, SCM, SE, RAS (Gravity Flow)	10	Water	"A"
DS, ECR, ECS, RAS (Pump	50	Water	"A"

Fluid Abbreviation or Name	Minimum Test Pressure in psi	Test Medium	Leakage Allowance Designation
Discharge) SPD, WAS			
DSL, TDSL, TSL, TWAS	100	Water	"A"
GR, IW, NPB, PE, PEC, PRS, SWS, NPW, PW	150	Water	"A"
DG	50	*(3)	Zero

(1) Leakage allowance designation "A" shall mean not more than 0.002 gallons per hour per inch diameter per 100 feet of buried pipe for all piping except buried mechanical joint or push-on joint pipe. Buried mechanical and push-on joint pipe shall meet the leakage specifications of AWWA C600.

(2) Leakage allowance Designation "B" shall mean a loss of pressure of not more than 5% during the test period.

(3)* Test medium shall be inert gas (CO₂ or N₂) if digester gas is present in any part of system.

F. Prior to making final connection between new and existing piping, new piping shall be tested as specified above.

G. Infiltration/Exfiltration Tests:

1. Leakage Testing:

- a. All sanitary sewer gravity mains, drains, and those pipes designated as PSS, PRF, RW, and D shall be tested for leakage after installation of laterals and placement of backfill. Leakage testing of thermoplastic and iron sanitary sewer gravity mains shall be conducted in accordance with ASTM F1417. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.
- b. Sewers 18 inches and larger may be tested for leakage by infiltration or exfiltration in lieu of vacuum testing. Concrete pipe shall be tested per ASTM C969 except as modified herein. If groundwater is 2 feet or more above the sewer, measurements will be taken to determine the rate of infiltration into the sewer. If groundwater is below 2 feet above the sewer, the stretch of sewer shall be plugged at its downstream end and water shall be placed inside the sewer to provide a minimum of 4 feet of head above the upstream end.
- c. Measurements will then be taken to determine the rate of leakage out of the sewer. CONTRACTOR shall furnish all labor and materials necessary for making the tests. The allowable leakage shall be as indicated below for final acceptance.
- d. At the conclusion of construction and before final acceptance of the Work, the downstream end of all sanitary sewer will be measured for infiltration. Allowable infiltration shall not exceed 100 gallons/inch of pipe diameter/mile/day for that portion of the Work under groundwater. If infiltration is exceeded, the leak or leaks shall be located and repaired.
- e. CONTRACTOR shall prepare all pipeline for testing and shall furnish all equipment, materials, tools, and labor necessary for performance of the tests. Equipment for the low pressure air test of gravity mains shall be equal in all operational aspects to that as furnished by Cherne Industries, Inc., United Survey, or equal.
- f. Test apparatus and gauges shall be located such that ENGINEER or OWNER do not have to enter a confined space to verify readings.

- g. Air and leakage testing of storm sewers will not be required.
- 2. Deflection Testing:
 - a. All PVC pipe used for sanitary sewer shall be tested for vertical deflection. Maximum deflection after completion of backfilling shall be 5% of the inside pipe diameter. Testing shall not be started until trench backfill has been in place for 30 days. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results. Deflection shall be measured by pulling a mandrel with a vertical diameter equal to 95% of the pipe inside diameter through the line, after thoroughly flushing the lines to be tested. The testing device shall be controlled using cables at both the upstream and downstream manholes. The testing device must pass freely through the sewer without the use of unreasonable force on the control cables. Any line that will not pass the test cylinder will not be accepted until the faulty sections have been removed and replaced and the line retested.
 - b. Deflection testing of thermoplastic storm sewer shall be provided in accordance with the above requirements.
- H. Manhole Testing:
 - 1. Sanitary sewer and process piping manholes shall be vacuum tested in accordance with ASTM C1244 or via Hydrostatic Exfiltration Test. Pipes entering the manhole shall be plugged and the seal inflated in accordance with manufacturer's recommendations. CONTRACTOR shall provide all required test apparatus, including vacuum pump and gauges.
 - 2. Hydrostatic Exfiltration Testing: All collection lines shall be plugged, and the manhole filled with water. If the leakage exceeds 0.025 gallons per foot of diameter of head per hour, repairs shall be made to reduce leakage, and retests shall be performed until the leakage is below 0.025 gallons per foot of diameter per foot of head per hour. Concrete manholes may be filled for 24 hours prior to testing to allow for saturation of the concrete. For all manholes within 9 feet of a potable water line, the manhole shall be water tight and tested to have no leakage using the Hydrostatic Exfiltration Testing Method.
 - 3. Vacuum testing of storm sewer and other manholes or structures may not be required.
- I. Televised Inspection: A color televised survey of installed sanitary sewer and storm sewer shall be provided after testing to confirm branch locations, verify cleanliness of sewer, and confirm presence or absence of sags or deviations in sewer alignment. Sewers shall be cleaned immediately prior to the survey. The survey shall conform to NASCO PACP standards.
- J. Continuity Testing: CONTRACTOR shall provide all equipment, labor, and materials necessary to perform continuity testing of all ductile iron water mains installed. Tests shall be performed using an ohmmeter to demonstrate that electrical continuity exists across all joints. CONTRACTOR shall make all necessary repairs to establish continuity across joints.

3.03 CLEANING AND DISINFECTION

- A. All equipment and materials shall be clean before installation. CONTRACTOR shall disinfect and flush the potable water system before it is put online. Water main shall be disinfected according to AWWA C651.

- B. In accordance with the requirements of AWWA C651, at least one set of samples shall be collected from every 1,200 feet of new water main, plus one set from the end of the line and at least one set from each branch.
- C. CONTRACTOR shall obtain water samples and arrange for analysis of water in potable systems for bacteria in accordance with Option A of Section 5.1 of AWWA C651. Copies of test results shall be submitted to OWNER and ENGINEER.
- D. CONTRACTOR shall furnish all water and other materials, equipment, and labor necessary to disinfect all new water mains and all existing water mains disturbed by construction. CONTRACTOR shall notify the Health Department to observe disinfection test and shall coordinate and bear cost for necessary laboratory testing and shall provide safe bacteriological sample results to OWNER prior to placing the water main in service. Sampling and testing shall be scheduled to complete the Work within the Contract Times. Items of material for testing shall be furnished in the size and quantity necessary to properly complete the test. Interruption or delay of CONTRACTOR's Work progress caused by testing and sampling shall not be cause for extra payment under the Contract nor shall they be cause for extension of Contract Time.
- E. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.
- F. All waste disposal areas and all areas used for the storage of materials, or the temporary deposit of excavated earth shall be leveled off, cleaned up, and returned to condition that existed prior to construction.
- G. All surplus material, tools, and equipment shall be removed, and the premises shall be left free of everything of the kind.

3.04 CLEANUP

- A. Upon completion of the work, all improvements disturbed by CONTRACTOR's operations shall be repaired or replaced. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.
- B. All areas used for the storage of materials, or the temporary deposit of excavated earth shall be leveled off and cleaned up. All surplus material, tools, and equipment shall be removed, and the premises shall be left free of everything of the kind.
- C. All pipes and manholes shall be flushed until clean, and all debris and mud shall be removed.

3.05 DEMOLITION

- A. All exterior piping removals, including manholes and appurtenances and abandonment, shall be by CONTRACTOR. The locations and elevations of existing piping are approximate. Where necessary, existing piping shall be exposed before installing new piping. Any changes in pipe location or elevation shall be reviewed by ENGINEER.
- B. CONTRACTOR shall remove or abandon all existing piping and appurtenances as noted. Unless otherwise shown or specified, piping and appurtenances to be removed shall become the property of CONTRACTOR and shall be removed from the site for salvage or

disposal. Unless otherwise shown or specified, piping shown or specified to be abandoned shall have each end plugged with concrete or nonshrink grout. Nonshrink grout shall be as specified in Division 03. Wherever excavations cross piping to be abandoned, piping shall be removed to the limits of the excavation and the ends shall be filled as specified above.

- C. Valve boxes and exposed valves and operators on piping to be abandoned shall be removed. All concrete surfaces to remain shall be patched as required to provide a smooth surface. Repiping and connections to new piping shall be as specified for new piping.
- D. It is the responsibility of CONTRACTOR to remove the items listed below, including piping and appurtenances, as specified, and patch all holes resulting therefrom unless specified or shown otherwise. The intent of these specifications is to require that the removal of materials, patching of all existing holes, and repiping be done in a workmanlike manner. All costs shall be included in the Lump Sum Bid.

END OF SECTION

SECTION 33 01 30

SUMMARY OF WORK–UTILITIES

PART 1–GENERAL

1.01 SUMMARY

- A. The Work consists of providing all the labor, material and equipment necessary to complete the following:
 - 1. Sewer Cleaning.
 - 2. Sewer Root Foaming.
 - 3. Sewer Televising.
 - 4. Sewer Bypass Pumping.
 - 5. Sewer Obstruction Removal.
 - 6. Sewer Chemical Sealing.
 - 7. Sewer Lining.
 - 8. Sewer Special Structural Liner.
 - 9. Sewer Lateral Inserts.
 - 10. Excavation Rehabilitation.
 - 11. Manhole Chemical Sealing.
 - 12. Manhole Casting and Cover Rehabilitation.
 - 13. Manhole Resurfacing and Coating.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern Work in this section.

1.02 SEQUENCING

- A. Applicable provisions of Section 01 11 00–Summary of Work govern construction sequencing.

1.03 EXISTING SYSTEM

- A. Applicable provisions of Section 01 11 00–Summary of Work describe the existing system.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Applicable provisions of Section 01 60 00–Materials and Equipment govern the handling, storage, and protection of materials and equipment.

1.05 DEFINITIONS

- A. The following definitions or abbreviations apply to the Work in this Division:
 - 1. CCTV–closed-circuit color television
 - 2. NASSCO–National Association of Sewer Service Companies
 - 3. Mobilization–The initial process of assembling, making ready, and transporting to the Project site, the necessary materials and equipment to complete the package of Work designated by OWNER. The timetable for mobilization shall be as needed to allow for completion of the Work within the time frame required by OWNER.

1.06 SUBMITTALS

- A. Any proposed method of sewage bypass pumping shall be submitted in accordance with Section 33 01 31–Sewer Bypass Pumping.

1.07 MATERIALS AND SUPPLIES

- A. CONTRACTOR shall provide materials and supplies to satisfactorily complete the Work to the satisfaction of OWNER. Materials and supplies shall be suitable for the environment in which they are to be used or installed and shall be compatible with each other.
- B. Suppliers shall be deemed to impliedly warrant that their products and all component materials incorporated into them are suitable and fit for the intended use of such products and shall be free from defect in material, workmanship or design, such warranty to run to the benefit of OWNER and ENGINEER. The foregoing applies whether the products or their component parts are specified in the Contract Documents or are of supplier's design.

1.08 WATER

- A. CONTRACTOR is responsible for making all arrangements to obtain water and for its use in the Work, whether it is provided by OWNER or otherwise. See Section 01 50 00–Temporary Facilities.

1.09 WASTE DISPOSAL

- A. CONTRACTOR is responsible for proper and safe disposal of all material removed from the sewers.

1.10 PAYMENT

- A. Payment for changes in quantities, as shown in the Bid, shall be made in accordance with the prices bid for the Work for the various items indicated. No change of quantities shall annul or impair the Contract made and entered into relative to said Work. Payment shall be made for the quantities of each Bid item as actually installed.
- B. If a price is not provided in the Bid for an item of Work, the Work shall be considered incidental and included in adjacent or associated items of Work.
- C. Cost for providing the following shall be considered incidental to the Work unless otherwise indicated in the Bid.
 - 1. Providing water for use in the Work.
 - 2. Removing, transporting, and disposing of material from the sewers.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 SITE CONDITIONS

- A. CONTRACTOR is expected to examine carefully the site of the proposed Work and fully acquaint itself with the conditions as they exist to fully understand any restraints, difficulties or other extenuating circumstances that may be present during the performance of the Work.
- B. See the Supplementary Conditions for listing of any reports and drawings related to the Work.

3.02 PROTECTION

- A. The sewers in the Project are operated and maintained by OWNER. CONTRACTOR shall perform the Work in such a manner that the operation of the existing sewers and pumping stations are not interrupted, impaired or damaged. Existing sewers and pumping stations must be maintained in operation at all times or adequate provisions provided to convey both dry and wet weather flow. No CONTRACTOR operation shall impede the functions of the pumping station or sewer system including increasing surcharging in the system and basement backups. Any Work impacting the operation of OWNER's system shall be coordinated with OWNER.
- B. CONTRACTOR shall assume full responsibility for any damage to adjacent lands and buildings and to the owners or occupants thereof. CONTRACTOR shall examine adjacent lands and buildings and shall account for protection of the lands and buildings during the Work. Any damage caused shall be repaired at the expense of CONTRACTOR.
- C. CONTRACTOR shall be aware of the attractive nuisance of the Work and make provisions for mitigating any problems. See Division 01.
- D. CONTRACTOR shall take into account the impact precipitation events may have on the Work and shall schedule the Work accordingly. CONTRACTOR shall protect Work from damage caused by such events whether locally or regionally as they may impact the Work.

3.03 SEWER SERVICE

- A. It shall be CONTRACTOR's responsibility to maintain sewer service throughout the duration of the Work. When the Work is being conducted, CONTRACTOR shall maintain sewer service by use of bypass pumping as necessary. Sewer service shall be maintained to each home or business that is connected to the sewer or manhole where the Work is being conducted. All sewers shall be kept in service when work is not being performed.
- B. Sewage or jetting water shall not be allowed to back up into residential, commercial, or public structures. CONTRACTOR shall be responsible for preventing any sewage backups or cleaning impacts of such backups should they occur.

3.04 USE OF PREMISES

- A. CONTRACTOR shall confine its operations, equipment and storage areas to the existing rights-of-way and easements as shown on the Drawings in which the existing sewer system is located unless CONTRACTOR enters into written agreements with property owners for use of lands during construction. Such agreements shall be provided to OWNER.

END OF SECTION

SECTION 33 01 31

SEWER BYPASS PUMPING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Providing all materials, labor, equipment, power, and maintenance necessary to perform bypass pumping while the Work is being completed.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- C. Coordinate the Work of this section with Section 33 01 30–Summary of Work–Utilities.
- D. Unit Price: A unit price is not provided for Sewer Bypass Pumping.
- E. Payment:
 - 1. No separate payment item is included for Sewer Bypass Pumping. All costs for bypass pumping required to complete the Work shall be considered incidental to the Work and included in the cost of adjacent or related Work.
 - 2. The cost of retrieving equipment under all circumstances, including when it becomes lodged, shall be incidental to the Work.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01 33 00–Submittals.
 - 1. CONTRACTOR shall submit to OWNER detailed plans and descriptions outlining all provisions and precautions to be taken by CONTRACTOR regarding the handling of existing sewage flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to provide proper protection of the facilities, including protection of the access and bypass pumping locations from damage because of the discharge flows and compliance with the requirements specified in these Contract Documents. No rehabilitation or construction shall begin until all provisions and requirements have been reviewed by OWNER.
 - 2. The Bypass Pumping plan shall include but not be limited to details of the following:
 - a. Staging areas for pumps.
 - b. Sewer plugging method and types of plugs.
 - c. Number, size, material, location, and method of installation of suction piping.
 - d. Number, size, material, method of installation, and location of installation of discharge piping.
 - e. Bypass pump sizes, capacity, number of each size to be on-site, and power requirements.
 - f. Standby power generator size and location.
 - g. Downstream discharge plan.
 - h. Method of protecting discharge manholes or structures from erosion and damage.
 - i. Method of noise control for each pump and/or generator.
 - j. Any temporary pipe supports and anchoring required.

- k. Design plans for access to bypass pumping locations.
- l. Schedule for installation and maintenance of bypass pumping lines.
- m. Plan indicating location of bypass pumping lines.

B. Any proposed method of other flow controls shall be submitted for review by OWNER.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 SEWER BYPASS PUMPING

- A. Where required by sewage flows or inability to prevent debris from falling into the flow stream, CONTRACTOR shall bypass the sewage around the sewer sections or manholes as required to complete the Work.
- B. Precautions shall be taken when bypass pumping is required to prevent the flooding of nearby property.
- C. Under no circumstances will the diversion or dumping of raw sewage be allowed onto the streets, trenches, or into storm sewers. The bypass shall be made by plugging an existing upstream manhole and pumping the sewage into a downstream manhole or adjacent sanitary sewer system if acceptable to OWNER. Bypass pumping shall mean the use of pumps, tanks, hoses, and other necessary equipment to cause uninterrupted flow of sewage around the section or reach in which the Work is being accomplished.
- D. All bypass pumping operations must be attended by personnel to prevent flooding in case of pump failure. Under no conditions shall a bypass pumping operation be left unattended. All personnel for setup, operation, and supervision of the bypass pumping equipment shall be provided as necessary.
- E. All hoses and pumps shall be sized by CONTRACTOR to be of sufficient capacity to handle the existing sewage flow, plus additional flow that may occur during wet weather periods and during periods of high runoff. All equipment used in bypass pumping shall be operated and maintained in proper running condition at all times.
- F. All hose connections shall be watertight and no leakage shall be allowed to the surface. Pumping system hoses and appurtenances shall be tested prior to use in the sewer system to provide watertightness.
- G. CONTRACTOR shall provide a pump capable of conveying all flow that passes through the sewers within the bypassed area. A backup pump capable of conveying all flow that passes through the existing sewer pipes within the bypass area shall be present on site during bypass pumping operations. A backup generator capable of powering the bypass pump, if not integral to the backup pump, shall be provided on site during bypass pumping operations.
- H. No bypass pumping shall occur during non-working hours or on Saturday or Sunday without prior approval by OWNER. OWNER shall have the authority to prevent bypass pumping

operations from occurring on a specific day or days if OWNER decides that bypass pumping operations could occur during periods of forecasted rain events. CONTRACTOR shall adjust bypass pumping schedule based on comments and restrictions from OWNER at no cost to OWNER.

- I. At the end of each working day, the reach or section being bypassed shall be placed in service and the bypass plug removed.
- J. The pumps shall be specifically designed for sewage, capable of passing 3-inch solids.
- K. CONTRACTOR shall satisfactorily demonstrate to OWNER that the bypass system works for at least the diurnal flow pattern before beginning any Work.
- L. If bypass pumping is required over night, Contractor shall install an autodialer and a redundant pump into the bypass system.

END OF SECTION

SECTION 33 05 07

TRENCHLESS CONSTRUCTION

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Provide all utilities required through the use of trenchless construction techniques as shown on the drawings or as specified.
- B. Unit Prices: The unit price for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting shall include all labor, materials, and equipment to complete the Work.
- C. Measurement and Payment:
 - 1. Payment for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting shall be for work successfully performed.
 - 2. Measurement for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting will be based on the linear footage of pipe installed.

PART 2-PRODUCTS

2.01 PIPE AND APPURTENANCES

- A. Polyvinyl Chloride (PVC):
 - 1. See Section 33 00 10–Buried Piping and Appurtenances for PVC pipe specifications.
 - 2. All PVC pipe shall be restrained at each joint within steel casing pipe.
- B. High Density Polyethylene Pressure Pipe (HDPE): See Section 33 00 10–Buried Piping and Appurtenances for HDPE pipe specifications.
- C. Steel Casing Pipe:
 - 1. The welded steel casing pipe used shall be leak proof and of adequate diameter and thickness to support all jacking, earth, live, and other loads imposed and to permit installation of the carrier pipe to plan line and grade. The steel casing pipe shall be installed to within plus or minus 0.1 feet of designed grades. Type and minimum size of casing pipe shall be as called for below. Steel casing pipe shall conform to ASTM A139 Grade B. The minimum yield strength shall be 35,000 psi. The steel casing pipe shall be designed for E-80 loading.

Nominal Diameter, (Inches)	Minimum Thickness for Coated (Inches)	Noncoated (Inches)
12 and Under	0.188	0.188
14 and 16	0.219	0.282
18	0.250	0.313
20	0.281	0.344
22	0.312	0.375

Nominal Diameter, (Inches)	Minimum Thickness for Coated (Inches)	Noncoated (Inches)
24	0.344	0.407
26	0.375	0.438
28	0.406	0.469
30	0.406	0.469
32	0.438	0.501
34 and 36	0.469	0.532
38, 40 and 42	0.500	0.563
44 and 46	0.531	0.594
48	0.563	0.625
50	0.594	0.656
52	0.625	0.688
54	0.656	0.719
56 and 58	0.688	0.750
60	0.719	0.781
62	0.750	0.813
64	0.718	0.844
66 and 68	0.813	0.875
70	0.844	0.906
72	0.875	0.938

- (1) Thicker walls shall be provided to meet jacking pressures, soil loading, or to conform to permit requirements for the Work.
 - (2) Ring deflection shall not exceed 2% of the nominal diameter.
 - (3) Sections of pipe shall be field welded with a continuous circumferential, full depth single "V" groove (butt joint) weld. Welds shall have strength equal to pipe walls.
2. Casing pipe shall be installed using equipment and material that cases the hole as earth is removed to eliminate cavities at the lead end of the casing pipe. Grouting between casing pipe and soil opening shall be performed when needed to secure casing pipe, to prevent soil collapse, and to fill voids between the casing pipe and native soil. The front of the casing pipe shall be provided with a mechanical arrangement or device that positively prevents the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The auguring process shall be set such that it permits a balance between jacking pressures and the ratio of carrier pipe advancement to the quantity of soil excavated to eliminate voids in the soil. This is especially critical in the event granular, loose, or unstable soils are encountered at the face of the casing pipe. CONTRACTOR shall maintain a record of soil removed against carrier pipe volume as a check against formation of voids.
 3. The carrier pipe shall be placed inside the casing pipe using stainless steel casing spacers. Casing spacers shall be designed to guide and support the carrier pipe in the casing. Standard casing spacers shall consist of a 14-gauge AISI type 304 stainless steel risers. Each riser shall be equipped with a removable ultra-high-molecular weight polymer- or glass-reinforced plastic runner. Attachment hardware shall be AISI Type 304 stainless steel. Spacers shall have a minimum width of 8 inches. Standard casing spacers shall be Cascade Waterworks Manufacturing Model CCS, Advance products and Systems, Inc., or Pipeline Seal and Insulator, Inc.,

Model S8G. At least three spacers shall be provided for each length of carrier pipe, but the number of spacers used shall be not less than the minimum requirements of the manufacturer. They shall be attached to the barrel of the carrier pipe so they are parallel to the longitudinal centerline. The annular space between the casing pipe and carrier pipe shall be left empty.

4. All carrier pipe within the limits of jacking pits shall be installed at CONTRACTOR's expense to resist all loads imposed including, if necessary, the use of special pipe.
- D. Tracer Wire: Tracer wire shall be installed on all trenchless piping. CONTRACTOR shall attach a continuous 7 by 19 strand core, 1/4-inch-diameter vinyl-coated galvanized aircraft cable pulled with the horizontal directional drilling operation as tracer wire. Aircraft cable shall be attached to the pipe at 20-foot intervals. If the HDD is through rock, CONTRACTOR shall provide a minimum of two aircraft cables attached to the pipe. Tracer wire shall be successfully tested before acceptance.

PART 3—EXECUTION

3.01 HORIZONTAL DIRECTIONAL DRILLING

- A. Where shown on the Drawings, horizontal directional drilling shall be provided using HDPE pipe.
- B. A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied. Test reports prepared by an independent testing laboratory shall be provided certifying that polyethylene pipe conforms to the requirements of ASTM D3350.
- C. Subject to compliance with the complete requirements of these Standard Specifications, manufacturers offering HDPE pipe products that may be incorporated into the Work include Performance Pipe, Poly Pipe, or equal.
- D. Fusion Welding: Polyethylene pipe shall be joined using the butt fusion welding process. Provide a fused flanged adapter with ductile iron follower flange and a ductile iron flanged pipe for interconnections with ductile iron and/or PVC piping.
- E. CONTRACTOR may use a drilling fluid which is completely biodegradable. Clay based drilling fluids will also be allowed. Drilling fluid shall be subject to the review of OWNER. CONTRACTOR shall provide his own clean water for drilling fluid. At no time shall the drilling fluid be discharged to a surface water. This includes drilling fluid that may surface along the directionally drilled pipe route. CONTRACTOR shall provide other drilling fluids or procedures as needed to prevent a discharge of drilling fluids to surface waters at no additional cost to OWNER.
- F. The boring unit shall have a tracking device that is capable of providing depth and location at all points of the boring path. Record Drawings showing horizontal and vertical locations of the conduit shall be created by CONTRACTOR based on the tracker information and submitted to OWNER.
 1. Finished Pipe:
 - a. CONTRACTOR shall submit detailed information to OWNER of the procedure and the steps to be followed for the installation of the directional drilling method selected, even if the process is named in the Standard Specifications. All such

instructions and procedures submitted shall be carefully followed during installation. Any proposed changes in installation procedures shall require submittal of revised procedures.

- b. The installed pipe shall be continuous over the entire directionally drilled length and shall be free from visual defects, such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, and other deformities. Pipe with gashes, nicks, abrasions, or any such physical damage that may have occurred during storage and/or handling, which are deeper than 10% of the wall thickness, shall not be used and shall be removed from the construction site.
 2. Pipe Jointing:
 - a. Sections of polyethylene pipe shall be assembled and joined on the jobsite above ground. Pipe ends to be joined shall be cut square, then joined, by the heating and butt fusion method in strict conformance with the manufacturer's printed instructions.
 - b. The butt fusion method for pipe jointing shall be carried out in the field by operators with prior experience in fusing polyethylene pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer. These joints shall have a smooth, uniform, double rolled back bead made while applying the proper melt, pressure, and alignment. It shall be the sole responsibility of CONTRACTOR to provide an acceptable butt fusion joint. The replacement pipe shall be joined on the site in appropriate working lengths near the insertion pit.
 3. Insertion or Access Pits:
 - a. The location and number of insertion or access pits shall be planned by CONTRACTOR and submitted in writing prior to excavation. The pits shall be located such that their total number shall be minimized, and the length of replacement pipe installed in a single pull shall be maximized. The maximum length of continuous liner shall not exceed the pipe bursting system manufacturer's recommendations.
 - b. Upon completion of the directional drilling operation by CONTRACTOR, CONTRACTOR shall backfill the excavation, perform clean up and all site restoration, as indicated on the drawings. All surfaces shall be restored in kind with thicknesses matching those removed.
 4. Process Limitations:
 - a. Though the installation process may be licensed or proprietary in nature, CONTRACTOR shall not change any material, thickness, design values, or procedures stated or approved in the submittals. CONTRACTOR shall submit, in writing, full details about component materials, their properties and installation procedures, and abide by them fully during the entire course of the Project.
 - b. All allowable directional drilling methods are considered to be structurally equal processes as far as end product required. The minimum required performance criteria, and/or standards, physical/structural properties, chemical resistance tests, and the replacement pipe thicknesses as given in this Standard Specification shall be strictly complied with.
- G. It is CONTRACTOR's responsibility to examine the proposed line segment and notify if conditions exist that could cause problems with the directional drilling method. Such conditions could include nearby services that could be damaged by the operations, existing slabs that could be damaged, or less than acceptable depth of cover.

3.02 TUNNELING, BORING, JACKING, OR BORING AND JACKING

- A. Where shown on the Drawings or specified, the sewer, water main, or force main (carrier pipe) shall be placed inside a casing pipe that is installed by tunneling, jacking, boring, or jacking and boring or other acceptable methods not using open cut construction techniques. Installation shall be accomplished in accordance with Federal and State Laws and municipal ordinances. Installation shall also conform to any permit requirements obtained by OWNER or CONTRACTOR from railroads; local, county, state or federal agencies; or any other such entity requiring a permit to allow the Work to proceed. Should there be a conflict between permit requirements and those herein, the stricter requirement shall control.
- B. CONTRACTOR's means and methods of construction shall be capable of controlling water and soil infiltration at the excavated face, along the alignment and at shaft excavations to properly conduct the Work, to maintain a stable excavation, and to prevent collapse of the ground. CONTRACTOR shall obtain any dewatering permits required. If CONTRACTOR's means and methods are not effective in controlling such infiltration, CONTRACTOR shall select other means and methods and demonstrate to OWNER that water and soil infiltration can be excluded, all at no additional cost to OWNER. Shafts and open cut excavations shall be excavated by methods determined by CONTRACTOR to be capable of and suitable for coping with the surface and subsurface conditions. CONTRACTOR shall have a representative on site at all times who is experienced in the tunneling technique being used.
- C. Installation of casing and carrier pipe shall proceed in such a manner as to minimize disruption of traffic and to avoid damage to adjacent roadways, railroad tracks, and other structures. No equipment shall operate off the pavement or tracks or the shoulder of the roadway or tracks being crossed during the course of construction. Signs, barricades, flag men, and lighting shall be provided or may be modified by any permit requirements and as needed to complete the Work—the more stringent requirement controlling.
- D. CONTRACTOR shall submit manufacturer's data for the casing pipe, spacers, and carrier pipe. Information shall include the name of the pipe manufacturer, the dimensions of the pipe, and details on the material and method of pipe manufacturer or fabrication.
- E. CONTRACTOR shall submit a jacking plan for each installation. The plan shall identify the method and equipment to be used, the location and size of the jacking pits, and the limits of the proposed jacking.
- F. The carrier pipe shall be the same material as specified for open cut installation in the adjacent pipe.
- G. All casing pipe shall be on-site before any jacking is to start. Once jacking operation is started, it shall be continued without interruption until completion. The position for spacers shall adequately support the carrier pipe throughout the casing. A casing spacer shall be installed within 1 foot of each end of the casing, on each side of each pipe joint, and at a maximum spacing of 10 feet for ductile iron carrier pipe. The carrier pipe shall be adjusted so that the end extends past the end of the casing 18 inches. After the carrier pipe is installed, the casing end seals shall be neoprene with stainless steel bands. The casing end seals shall be Cascade, or equal.

3.03 FINISHED PIPE

- A. The installed pipe shall be continuous over the entire length and shall be free from visual defects, such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, and other deformities. Pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site.

3.04 TESTING

- A. Testing of pipes installed with trenchless techniques shall be in accordance with Section 33 00 10.
- B. CONTRACTOR shall perform a continuity test on all tracer wire in the presence of ENGINEER or OWNER. Continuity testing shall be performed prior to asphalt or concrete pavement placement. If the tracer wire is found to be not continuous after testing, CONTRACTOR shall repair or replace the failed segment of wire at CONTRACTOR's expense. All repairs or replacement shall be completed prior to asphalt or concrete placement.

END OF SECTION

Section 02091

NON METALLIC FRAMES AND COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Molded composite manhole frames and covers for application in wastewater collection system and facilities.
- B. All composite moldings shall consist of a thermosetting resin matrix blended and/or combined with reinforcing fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing structure(s). The thermosetting resin matrix shall be a polyester, vinylester, or a blend of these. The moldings shall be true to pattern in form and dimension and free from cracks, pores, knit-lines, or other defects in locations affecting their strength and value for the service intended.

1.02 MEASUREMENT AND PAYMENT

- A. Unit Prices.
 - 1. No payment will be made for Composite Frames and Covers under this Section. Include payment in unit price for related item.
 - 2. Payment to install on existing manhole is on a unit price basis for each manhole.
 - 3. Refer to Section Measurement and Payment for unit price procedures
- B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 REFERENCES

- A. AASHTO - American Association of State Highway and Transportation Officials
 - 1. M306-10: Drainage, Sewer, Utility, and Related Castings
 - a. Manufacture
 - b. Proof Testing
 - c. Inspection
 - d. Certification
 - e. Marking
 - 2. Standard Specification for Highway Bridges

- B. ASTM G154 – Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
- C. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction
- D. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- E. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- F. TCEQ Chapter 217 Design Criteria for Waste Water Systems Section 217.55 Manhole Covers
- G. Texas Department of Transportation Approval

1.04 SUBMITTALS

- A. Conform to requirements of Submittals Section - Submittal Procedures.
- B. Submit copies of manufacturer's specifications, testing data, certifications, load tables, dimension diagrams, anchor details, and installation instructions.
- C. Submit shop drawings for fabrication and installation of casting assemblies that are not included in Drawings or standard Utility details. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART 2 PRODUCTS

2.01 MANHOLE RING AND COVER

- A. All rings and covers units shall be made from high strength nonmetallic fiber reinforced polymer/composite materials. The material shall be a resin thermoset matrix that can be reinforced with continuous filament engineered fabrics, fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing structure(s). Sealing gaskets shall be bonded to the frame continuously at the interface with the cover to reduce wear, shock, noise, malodors and infiltration.
- B. Rings and covers intended for traffic service shall be capable of withstanding AASHTO M306: Proof Testing (includes items such as frames, covers etc.)
- C. Fabricate rings and covers to conform to shapes, dimensions, and with wording or logos shown on Utility Drawings as required.

D. MOLDING PROCESS

1. Before the moldings are removed from the molding operation, they shall be thoroughly deflashed and cleaned at the parting lines, holes, notches and all exposed edges.
2. If using a lock, or latch, these must be independent of the method used to open the cover to ensure the cover can be opened in the event of lock or latch failure.
3. Covers and frames shall be compression molded under high pressures (>0.5 tons/sq. inch of x-y surface area) and high temperatures (>200 degrees F).
4. Metal reinforcements or metal hinges molded within the composite shall not be permitted. Small non-stress bearing pieces of metal may be encapsulated or attached.

E. All rings and covers shall be molded and assembled in the United States in accordance with the requirements of AASHTO M306.

F. Covers shall be provided with a positive sealing mechanism by means of four (4) austenitic 316 stainless steel one half inch (1/2") nuts and bolts # 11 National Coarse Thread. Nuts shall be molded in or attached at pre-molded designated points of the frame and shall be Teflon Coated. For bolted manhole covers a thin film of an "Anti-Seize" lubricant, approved by the Engineer, or his designated representative shall be applied to all bolts. Bolts shall be threaded by hand prior to the use of wrenches. Other equivalent locking mechanisms must be approved by the Utility.

G. Composite covers shall be detectable by metal detectors.

H. Composite Covers shall be furnished with 2 concealed pick holes molded with 316 stainless steel inserts. An additional 316 stainless steel lifting clip shall be molded into the top of the cover to facilitate removal and replacement.

I. Composite covers shall have provisions for 316 stainless steel threaded inserts molded into the bottom surface to accommodate monitoring and remote transmission sensors and antenna utilized by the utility. Antenna placed on the bottom side shall have the capability to transmit through the cover without the need to drill and install antenna on the upper surface.

J. Markings: Covers and Frames shall have the following molded into the substrate of the cover

1. Name (or abbreviation) of molder
2. Country of Origin
3. Molding Date
4. Indication that material is non-metallic

- J. Composite frame and covers shall be Composite Access Products, L.P., McAllen, Texas or pre-approved equal as documented by the Utility.

2.02 TESTING AND PERFORMANCE REQUIREMENTS

- A. Testing shall be performed in accordance with the following inspection criteria unless otherwise specified in the contract or purchase order. The manufacturer/supplier shall be responsible for carrying out all of the required tests and inspections. All testing shall be conducted in the United States using purchaser approved reliable facilities. The manufacturer/supplier shall maintain complete records of all such tests and inspections. All testing shall be paid for by the manufacturer/supplier.
- B. Frames and Covers shall be "Proof Tested" in accordance with AASHTO M306.
- C. Heavy Duty: A load of 50,000lbs shall be concentrated on a 9" x 9" block with rubber or fiber backing pad for one minute. During the load testing process visible cracks or delamination will be cause for rejection. When load is removed, Permanent Set (Deflection) of more than 1/8" (.125") measured at center of load area will be cause for rejection. All testing shall be conducted on a NIST calibrated and Certified load test machine.
- D. Ultraviolet resistance: ASTM G154 Cycle 1 for 1000 hrs. Specimens shall be tested for ultimate flexural strength, retaining at least 75% of control values for load and deflection at failure.
- E. Coefficient of Friction: Shall be greater than 0.6 when tested in accordance to ASTM C1028.
- F. At the request of the Project Manager, the quality process manual shall be available for review. Manufacturing facility shall also be available for inspection to ensure quality standards are met along with EPA and OSHA standards.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install composite frames and covers according to approved shop drawings, instructions in related specifications and details, and written installation instructions from manufacturer.
- B. Set units accurately at required locations to proper alignment and elevation. Keep units plumb, level, true, and free of trash. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.

END OF SECTION

Item 1

Abbreviations and Definitions



1. APPLICABILITY

Wherever the following terms are used in these specifications or other Contract documents, the intent and meaning will be interpreted as shown below.

2. ABBREVIATIONS

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standard Committee, Inc.
AMRL	AASHTO Materials Reference Laboratory
ANLA	American Nursery and Landscape Association
ANSI	American National Standards Institute
APA	The Engineered Wood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASBI	American Segmental Bridge Institute
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWC	American Wood Council
AWG	American Wire Gage
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BMP	Best Management Practices
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
COE	U.S. Army Corps of Engineers
CRSI	Concrete Reinforcing Steel Institute
DBE	Disadvantaged Business Enterprise
DMS	Departmental Material Specification
EIA	Electronic Industries Alliance
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration, U.S. Department of Transportation
FSS	Federal Specifications and Standards (General Services Administration)
GSA	General Services Administration
HUB	Historically Underutilized Business
ICEA	Insulated Cable Engineers Association

IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IMSA	International Municipal Signal Association
ISO	International Organization for Standardization
ITS	Intelligent Transportation System
ITE	Institute of Transportation Engineers
LRFD	Load and Resistance Factor Design
MASH	Manual for Assessing Safety Hardware
MPL	Material Producer List
NCHRP	National Cooperative Highway Research Program
NCR	Nonconformance Report
NEC	National Electrical Code (Published by NFPA)
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NRM	Nonhazardous Recyclable Material
NRMCA	National Ready Mixed Concrete Association
NSBA	National Steel Bridge Alliance
NTPEP	National Transportation Product Evaluation Program
OSHA	Occupational Safety & Health Administration, U.S. Department of Labor
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PPI	Plastics Pipe Institute
PS&E	Plans, Specifications, and Estimates
PSL	Project-Specific Location
PTI	Post-Tension Institute
QA	Quality Assurance
QC	Quality Control
RCP	Reinforced Concrete Pipe
RPLS	Registered Public Land Surveyor
RRC	Railroad Commission of Texas
SBE	Small Business Enterprise
SFPA	Southern Forest Products Association
SI	International System of Units
SPIB	Southern Pine Inspection Bureau
SSPC	The Society for Protective Coatings
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDLR	Texas Department of Licensing and Regulation
TMUTCD	Texas Manual on Uniform Traffic Control Devices
UL	Underwriters Laboratory, Inc.
USC	United States Code
WRI	Wire Reinforcement Institute
WWPA	Western Wood Products Association

3. DEFINITIONS

- 3.1. **Abrasive Blasting.** Spraying blasts of pressurized air combined with abrasive media.
- 3.2. **Actual Cost.** Contractor's actual cost to provide labor, material, equipment, and project overhead necessary for the work.
- 3.3. **Addendum.** Change in proposal forms developed between advertising and bid submittal deadline.

- 3.4. **Additive Alternate.** A bid item contained in a proposal that is not a regular item or a replacement alternate bid item. The additive alternate item(s) include work that may be added to the base bid at the time of letting.
- 3.5. **Advertisement.** The public announcement required by law inviting bids for work to be performed or materials to be furnished.
- 3.6. **Affiliates.** Two or more firms are affiliated if they share common officers, directors, or stockholders; a family member of an officer, director, or stockholder of one firm serves in a similar capacity in another of the firms; an individual who has an interest in, or controls a part of, one firm either directly or indirectly also has an interest in, or controls a part of, another of the firms; the firms are so closely connected or associated that one of the firms, either directly or indirectly, controls or has the power to control another firm; one firm controls or has the power to control another of the firms; or the firms are closely allied through an established course of dealings including, but not limited to the lending of financial assistance.
- 3.7. **Air Blasting.** Spraying blasts of pressurized air free of oil and moisture.
- 3.8. **Air Temperature.** The temperature measured in degrees Fahrenheit (°F) in the shade, not in the direct rays of the sun, and away from artificial heat.
- 3.9. **Anticipated Profit.** Profit for work not performed.
- 3.10. **Apparent Low Bidder.** The Bidder determined to have the numerically lowest total bid as a result of the tabulation of bids by the Department.
- 3.11. **Architect of Record.** A person registered as an architect or licensed as a landscape architect, in accordance with State law, exercising overall responsibility for the design or a significant portion of the design and performs certain Contract administration responsibilities as described in the Contract; or a firm employed by the State to provide professional architectural services.
- 3.12. **Arterial Highway.** A highway used primarily for through traffic and usually on a continuous route.
- 3.13. **Available Bidding Capacity.** The Contractor's approved bidding capacity less uncompleted work on Department Contracts.
- 3.14. **Award.** The Commission's acceptance of a Contractor's bid for a proposed Contract that authorizes the Department to enter into a Contract.
- 3.15. **Bid.** The offer from the Bidder for performing the work described in the proposal.
- 3.16. **Bid Bond.** The security executed by the Contractor and the Surety furnished to the Department to guarantee payment of liquidated damages if the Contractor fails to enter into an awarded Contract.
- 3.17. **Bid Error.** A mathematical mistake made by a Bidder in the unit price entered into the proposal.
- 3.18. **Bidder.** An individual, partnership, limited liability company, corporation, or joint venture submitting a bid for a proposed Contract.
- 3.19. **Bidders Questionnaire.** A prequalification form completed by a prospective Bidder reflecting a Bidder's financial data and experience.
- 3.20. **Bidding Capacity.** The maximum dollar value a Contractor may have under Contract with the Department at any given time.
- 3.21. **Blast Cleaning.** Using one of the blasting methods including, but not limited to water blasting, low-pressure water blasting, high-pressure water blasting, abrasive blasting, water-abrasive blasting, shot blasting, slurry blasting, water injected abrasive blasting, and brush blasting.

- 3.22. **Bridge.** A structure, including supports, erected over a depression or an obstruction (e.g., water, a highway, or a railway) having a roadway or track for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 ft. between faces of abutments, spring lines of arches, or extreme ends of the openings for multiple box culverts.
- 3.23. **Brush Blasting.** Sweeping lightly with an abrasive blast to remove loose material.
- 3.24. **Building Contract.** A Contract entered under Transportation Code, Chapter 223, Subchapter A, "Competitive Bids," for the construction or maintenance of a Department building or appurtenance facilities. Building Contracts are considered to be construction Contracts.
- 3.25. **Callout Work.** Contracts, or work items in Contracts, that require a Contractor's response on an as-needed basis (e.g., see Item 351, "Flexible Pavement Structure Repair").
- 3.26. **Certificate of Insurance.** A form approved by the Department covering insurance requirements stated in the Contract.
- 3.27. **Change Order.** Written order to the Contractor detailing changes to the specified work, item quantities or any other modification to the Contract.
- 3.28. **Commission.** The Texas Transportation Commission or authorized representative.
- 3.29. **Concrete Construction Joint.** A joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set.
- 3.30. **Concrete Repair Manual.** Department manual specifying methods and procedures for concrete repair as an extension of the standard specifications.
- 3.31. **ConcreteWorks®.** Department-owned software for concrete heat analysis. Software is available on Department website.
- 3.32. **Construction Contract.** A Contract entered under Transportation Code, Chapter 223, Subchapter A, for the construction, reconstruction, or maintenance of a segment of the State highway system.
- 3.33. **Consultant.** The licensed professional engineer or engineering firm, or the architect or architectural firm, registered in the State of Texas and under Contract to the Department to perform professional services. The consultant may be the Engineer or architect of record or may provide services through and be subcontracted to the Engineer or architect of record.
- 3.34. **Contract.** The agreement between the Department and the Contractor establishing the obligations of the parties for furnishing of materials and performance of the work prescribed in the Contract documents.
- 3.35. **Contract Documents.** Elements of the Contract including, but not limited to the plans, specifications incorporated by reference, special provisions, special specifications, Contract bonds, change orders, and supplemental agreements.
- 3.36. **Contract Time.** The number of working days specified for completion of the work, including authorized additional working days.
- 3.37. **Contractor.** The individual, partnership, limited liability company, corporation, or joint venture and all principals and representatives with which the Contract is made by the Department.
- 3.38. **Controlled Access Highway.** Any highway to or from which access is denied or controlled, in whole or in part, from or to abutting land or intersecting streets, roads, highways, alleys, or other public or private ways.

- 3.39. **Control of Access.** The condition in which the right to access of owners or occupants of abutting land or other persons in connection with a highway is fully or partially controlled by public authority.
- 3.40. **Control Point.** An established point shown on the plans to provide vertical and horizontal references for geometric control for construction.
- 3.41. **Cross-Sections.** Graphic representations of the original ground and the proposed facility, at right angles to the centerline or base line.
- 3.42. **Culvert.** Any buried structure providing an opening under a roadway for drainage or other purposes. Culverts may also be classified as bridges. (See Section 1.3.22., "Bridge.")
- 3.43. **Cycle.** The activity necessary for performing the specified work within the right of way project limits once.
- 3.44. **Daily Road-User Cost.** Damages based on the estimated daily cost of inconvenience to the traveling public resulting from the work.
- 3.45. **Debar (Debarment).** Action taken by the Department or federal government pursuant to regulation that prohibits a person or company from entering into a Contract, or from participating as a subcontractor, or supplier of materials or equipment used in a highway improvement Contract as defined in Transportation Code, Chapter 223, Subchapter A.
- 3.46. **Detour.** A temporary traffic route around a closed portion of a road.
- 3.47. **Department.** The Texas Department of Transportation (TxDOT).
- 3.48. **Departmental Material Specifications.** Reference specifications for various materials published by the Construction Division.
- 3.49. **Direct Traffic Culvert.** Concrete box culvert whose top slab is used as the final riding surface or is to have an overlay or other riding surface treatment.
- 3.50. **Disadvantaged Business Enterprise.** A for-profit small business certified through the Texas Unified Certification Program in accordance with 49 CFR Part 26, that is at least 51% owned by one or more socially and economically disadvantaged individuals, or in the case of a publicly owned business, in which is at least 51% of the stock is owned by one or more socially and economically disadvantaged individuals, and whose management and daily business operations are controlled by one or more of the individuals who own it.
- 3.51. **Divided Highway.** A highway with separate roadways intended to move traffic in opposite directions.
- 3.52. **Easement.** A real property right acquired by one party to use land belonging to another party for a specified purpose.
- 3.53. **Electronic Vault.** The Department's bidding system where electronic bids are stored before bid opening.
- 3.54. **Engineer.** The Chief Engineer of the Department or the authorized representative of the Chief Engineer.
- 3.55. **Expressway.** A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at intersections.
- 3.56. **Family Member.** A family member of an individual is the individual's parent, parent's spouse, step-parent, step-parent's spouse, sibling, sibling's spouse, spouse, child, child's spouse, spouse's child, spouse's child's spouse, grandchild, grandparent, uncle, uncle's spouse, aunt, aunt's spouse, first cousin, or first cousin's spouse.

- 3.57. **Force Account.** Payment for directed work based on the actual cost of labor, equipment, and materials furnished with markups for project overhead and profit.
- 3.58. **Freeway.** An expressway with full control of access.
- 3.59. **Frontage Road.** A local street or road auxiliary to and located along an arterial highway for service to abutting property and adjacent areas and for control of access (sometimes known as a service road, access road, or insulator road).
- 3.60. **Hazardous Materials or Waste.** Hazardous materials or waste include but are not limited to explosives, compressed gas, flammable liquids, flammable solids, combustible liquids, oxidizers, poisons, radioactive materials, corrosives, etiologic agents, and other material classified as hazardous by 40 CFR 261, or applicable state and federal regulations.
- 3.61. **High-Pressure Water Blasting.** Water blasting with pressures between 5,000 and 10,000 psi.
- 3.62. **Highway, Street, or Road.** General terms denoting a public way for purposes of vehicular travel, including the entire area within the right of way. Recommended usage in urban areas is highway or street; in rural areas, highway or road.
- 3.63. **Historically Underutilized Business.** A corporation, sole proprietorship, partnership, or joint venture formed for the purpose of making a profit certified by the Texas Building and Procurement Commission, and 51% owned by one or more persons who are economically disadvantaged because of their identification as members of certain groups, including African Americans, Hispanic Americans, Asian-Pacific Americans, Native Americans, or women, and have a proportionate interest and demonstrate active participation in the control, operation, and management of the business' affairs. Individuals meeting the HUB definition are required to be residents of the State of Texas. Businesses that do not have their primary headquarters in the State of Texas are not eligible for HUB certification.
- 3.64. **Incentive and Disincentive Provisions.** An adjustment to the Contract price of a predetermined amount for each day the work is completed ahead of or behind the specified milestone, phase, or Contract completion dates. The amount of the incentive and disincentive is determined based on estimated costs for engineering, traffic control, delays to the motorists, and other items involved in the Contract.
- 3.65. **Independent Assurance Tests.** Tests used to evaluate the sampling and testing techniques and equipment used in the acceptance program. The tests are performed by the Department and are not used for acceptance purposes.
- 3.66. **Inspector.** The person assigned by the Engineer to inspect for compliance with the Contract any or all parts of the work and the materials used.
- 3.67. **Intelligent Transportation System.** An integrated system that uses video and other electronic detection devices to monitor traffic flows.
- 3.68. **Intersection.** The general area where 2 or more highways, streets, or roads join or cross, including the roadway and roadside facilities for traffic movements within it.
- 3.69. **Island.** An area within a roadway from which vehicular traffic is intended to be excluded, together with any area at the approach occupied by protective deflecting or warning devices.
- 3.70. **Joint Venture.** Any combination of individuals, partnerships, limited liability companies, or corporations submitting a single bid proposal.
- 3.71. **Lane Rental.** A method to assess the Contractor daily or hourly rental fees for each lane, shoulder, or combination of lanes and shoulders taken out of service.

- 3.72. **Letting.** The receipt, opening, tabulation, and determination of the apparent low Bidder.
- 3.73. **Letting Official.** The Executive Director or any Department employee empowered by the Executive Director to officially receive bids and close the receipt of bids at a letting.
- 3.74. **Licensed Professional Engineer.** A person who has been duly licensed by the Texas Board of Professional Engineers to engage in the practice of engineering in the State of Texas; also referred to as a Professional Engineer.
- 3.75. **Limits of Construction.** An area with established boundaries, identified within the highway right of way and easements, where the Contractor is permitted to perform the work.
- 3.76. **Local Street or Road.** A street or road primarily for access to residence, business, or other abutting property.
- 3.77. **Low-Pressure Water Blasting.** Water blasting with pressures between 3,000 and 5,000 psi.
- 3.78. **Major Item.** An item of work included in the Contract that has a total cost equal to or greater than 5% of the original Contract or \$100,000 whichever is less. A major item at the time of bid will remain a major item. An item not originally a major item does not become one through the course of the Contract.
- 3.79. **Manual of Testing Procedures.** Department manual outlining test methods and procedures maintained by the Materials and Pavements Section of the Construction Division.
- 3.80. **Material Producer List.** Department maintained list of approved products.
- 3.81. **Materially Unbalanced Bid.** A bid that generates a reasonable doubt that award to the Bidder submitting a mathematically unbalanced bid will result in the lowest ultimate cost to the State.
- 3.82. **Mathematically Unbalanced Bid.** A bid containing bid prices that do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs.
- 3.83. **Median.** The portion of a divided highway separating the traffic lanes in opposite directions.
- 3.84. **Milestone Date.** The date that a specific portion of the work is to be completed, before the completion date for all work under the Contract.
- 3.85. **Monolithic Concrete Placement.** The placement of plastic concrete in such manner and sequence to prevent a construction joint.
- 3.86. **National Holidays.** January 1, the last Monday in May, July 4, the first Monday in September, the fourth Thursday in November, and December 24 or December 25.
- 3.87. **Nonhazardous Recyclable Material.** A material recovered or diverted from the nonhazardous waste stream for the purposes of reuse or recycling in the manufacture of products that may otherwise be produced using raw or virgin materials.
- 3.88. **Nonresident Bidder.** A Bidder whose principal place of business is not in Texas. This includes a Bidder whose ultimate parent company or majority owner does not have its principal place of business in Texas.
- 3.89. **Nonresponsive Proposal.** A proposal that does not meet the criteria for acceptance contained in the proposal form.
- 3.90. **Non-Site-Specific Contracts.** Contracts where a geographic region is specified for the work and work orders, with or without plans, detail the limits and work to be performed.

- 3.91. **Notification.** Either written or oral instruction to the Contractor. Voice mail is oral notification.
- 3.92. **Pavement.** That part of the roadway having a constructed surface for the use of vehicular traffic.
- 3.93. **Pavement Structure.** Combination of surface course and base course placed on a subgrade to support the traffic load and distribute it to the roadbed.
- 3.93.1. **Surface Course.** Pavement structure layers designed to accommodate the traffic load. The top layer resists skidding, traffic abrasion, and the disintegrating effects of climate and is sometimes called the wearing course.
- 3.93.2. **Base Course.** One or more layers of specified material thickness placed on a subgrade to support a surface course.
- 3.93.3. **Subgrade.** The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed.
- 3.93.4. **Subgrade Treatment.** Modifying or stabilizing material in the subgrade.
- 3.94. **Payment Bond.** The security executed by the Contractor and the Surety, furnished to the Department to guarantee payment of all legal debts of the Contractor pertaining to the Contract.
- 3.95. **Performance Bond.** The security executed by the Contractor and the Surety, furnished to the Department to guarantee the completion of the work in accordance with the terms of the Contract.
- 3.96. **Plans.** The drawings approved by the Engineer, including true reproductions of the drawings that show the location, character, dimensions, and details of the work and are a part of the Contract.
- 3.97. **Power of Attorney for Surety Bonds.** An instrument under corporate seal appointing an attorney-in-fact to act on behalf of a Surety in signing bonds.
- 3.98. **Prequalification.** The process for determining a Contractor's eligibility to bid work.
- 3.99. **Prequalification Statement.** The forms on which required information is furnished concerning the Contractor's ability to perform and finance the work.
- 3.100. **Project-Specific Location.** A material source, plant, waste site, parking area, storage area, field office, staging area, haul road, or other similar location either outside the project limits or within the project limits but not specifically addressed in the Contract.
- 3.101. **Proposal.** The offer from the Bidder submitted on the prescribed form, including addenda issued, giving unit bid prices for performing the work described in the plans and Specifications.
- 3.102. **Proposal Form.** The form printed and sent to the Bidder by the Department or printed by the Bidder from the Department's bidding system.
- 3.103. **Proposal Guaranty.** The security furnished by the Bidder as a guarantee that the Bidder will enter into a Contract if awarded the work.
- 3.104. **Quality Assurance.** Sampling, testing, inspection, and other activities conducted by the Engineer to determine payment and make acceptance decisions.
- 3.105. **Quality Control.** Sampling, testing, and other process control activities conducted by the Contractor to monitor production and placement operations.
- 3.106. **Ramp.** A section of highway for the primary purpose of making connections with other highways.

- 3.107. **Recurring Maintenance Work Contracts.** Contracts or work for which maintenance is needed at the same location on more than one occasion (e.g., mowing contracts for which mowing cycles are requested on multiple occasions).
- 3.108. **Referee Tests.** Tests requested to resolve differences between Contractor and Engineer test results. The referee laboratory is the Construction Division.
- 3.109. **Regular Item.** A bid item contained in a proposal and not designated as an additive alternate or replacement alternate bid item.
- 3.110. **Rental Rate Blue Book for Construction Equipment.** Publication containing equipment rental rates.
- 3.111. **Replacement Alternate.** A bid item identified the proposal form that a Bidder may substitute for a specific regular item of work.
- 3.112. **Responsive Bid.** A proposal that meets all requirements of the proposal form for acceptance.
- 3.113. **Right of Way.** A general term denoting land or property devoted to transportation purposes.
- 3.114. **Roadbed.** The graded portion of a highway prepared as foundation for the pavement structure and shoulders. On divided highways, the depressed median type and the raised median type highways are considered to have 2 roadbeds. Highways with a flush median are considered to have 1 roadbed. Frontage roads are considered separate roadbeds.
- 3.115. **Road Master.** A railroad maintenance official in charge of a division of railway.
- 3.116. **Roadside.** The areas between the outside edges of the shoulders and the right of way boundaries. Unpaved median areas between inside shoulders of divided highways and areas within interchanges are included.
- 3.117. **Roadway.** The portion of the highway (including shoulders) used by the traveling public.
- 3.118. **Routine Maintenance Contract.** A Contract let through the routine maintenance contracting procedure to preserve and repair roadways, rights of way, and appurtenances.
- 3.119. **Sandblasting, Dry.** Spraying blasts of pressurized air combined with sand.
- 3.120. **Sandblasting, Wet.** Spraying blasts of pressurized water combined with sand.
- 3.121. **Shoulder.** That portion of the roadway contiguous with the traffic lanes for accommodation of stopped vehicles for emergency use or for lateral support of base and surface courses.
- 3.122. **Shot Blasting.** Spraying blasts of pressurized air combined with metal shot.
- 3.123. **Sidewalk.** Portion of the right of way constructed exclusively for pedestrian use.
- 3.124. **Slurry Blasting.** Spraying blasts of pressurized air combined with a mixture of water and abrasive media.
- 3.125. **Special Provisions.** Additions or revisions to these standard specifications or special specifications.
- 3.126. **Special Specifications.** Supplemental specifications applicable to the Contract not covered by these standard specifications.
- 3.127. **Specifications.** Directives or requirements issued or made pertaining to the method and manner of performing the work or to quantities and qualities of materials to be furnished under the Contract. References to DMSs, ASTM or AASHTO specifications, or Department bulletins and manuals, imply the latest standard

or tentative standard in effect on the date of the proposal. The Engineer will consider incorporation of subsequent changes to these documents in accordance with Item 4, "Scope of Work."

- 3.128. **Small Business Enterprise.** A firm (including affiliates) whose annual gross receipts do not exceed the U.S. Small Business Administration's size standards for 4 consecutive years.
- 3.129. **State.** The State of Texas.
- 3.130. **State Holiday.** A holiday authorized by the State Legislature excluding optional state holidays and not listed in Section 1.3.86., "National Holidays." A list of state holidays can be found on the Department's website.
- 3.131. **Station.** A unit of measurement consisting of 100 horizontal feet.
- 3.132. **Subcontract.** The agreement between the Contractor and subcontractor establishing the obligations of the parties for furnishing of materials and performance of the work prescribed in the Contract documents.
- 3.133. **Subcontractor.** A Subcontractor is defined as an individual, partnership, limited liability company, corporation, or any combination thereof that the Contractor sublets, or proposes to sublet, any portion of a Contract, excluding a material supplier, a hauling firm hauling only from a commercial source to the project, truck owner-operator, wholly-owned subsidiary, or specialty-type businesses such as security companies and rental companies.
- 3.134. **Subsidiary.** Materials, labor, or other elements that because of their nature or quantity have not been identified as a separate item and are included within the items on which they necessarily depend.
- 3.135. **Substructure.** The part of the structure below the bridge seats but not including, bearings, drilled shafts, or piling. Parapets, back walls, wing walls of the abutments, and drainage structures are considered parts of the substructure.
- 3.136. **Superintendent.** The representative of the Contractor who is available at all times and able to receive instructions from the Engineer or authorized Department representatives and to act for the Contractor.
- 3.137. **Superstructure.** The part of the structure above the bridge seats or above the springing lines of arches and including the bearings. Flatwork construction may be considered superstructure.
- 3.138. **Supplemental Agreement.** Written agreement entered into between the Contractor and the State and approved by the Surety, covering alterations and changes in the Contract. A supplemental agreement is used by the Department whenever the modifications include assignment of the Contract from one entity to another or other cases as desired by the Department.
- 3.139. **Surety.** The corporate body or bodies authorized to do business in Texas bound with and for the Contractor for the faithful performance of the work covered by the Contract and for the payment for all labor and material supplied in the prosecution of the work.
- 3.140. **Surplus Materials.** Any debris or material related to the Contract not incorporated into the work.
- 3.141. **Suspension.** Action taken by the Department or federal government pursuant to regulation that prohibits a person or company from entering into a Contract, or from participating as a subcontractor, or supplier of materials or equipment used in a highway improvement Contract as defined in Transportation Code, Chapter 223, Subchapter A.
- 3.142. **Traffic Lane.** The strip of roadway intended to accommodate the forward movement of a single line of vehicles.
- 3.143. **Traveled Way.** The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

- 3.144. **Truck Owner-Operator.** An individual who owns and operates 1 truck for hire.
- 3.145. **UT-Bridge.** Department-owned software for steel girder erection. Software is available on the Department's website.
- 3.146. **UT-Lift.** Department-owned software for steel girder erection. Software is available on the Department's website.
- 3.147. **Utility.** Privately, publicly, or cooperatively owned lines, facilities, and systems for producing, transmitting, or distributing communications, power, heat, gas, oil, water, waste, or storm water that are not connected with the highway drainage, signal systems, or other products that directly or indirectly serve the public; the utility company.
- 3.148. **Verification Tests.** Tests used to verify accuracy of QC and QA and mixture design testing.
- 3.149. **Water-Abrasive Blasting.** Spraying blasts of pressurized water combined with abrasive media.
- 3.150. **Water Blasting.** Spraying blasts of pressurized water of at least 3,000 psi.
- 3.151. **Water-Injected Abrasive Blasting.** Abrasive blasting with water injected into the abrasive/air stream at the nozzle.
- 3.152. **Wholly-Owned Subsidiary.** A legal entity owned entirely by the Contractor or subcontractor.
- 3.153. **Work.** The furnishing of all labor, materials, equipment, and other incidentals necessary for the successful completion of the Contract.
- 3.154. **Work Order.** Written notice to the Contractor to begin the work. The work order may include the date when work and time charges will begin, the allowable number of working days, and plan sheets providing details specific to a location or to an item of work for non-site-specific work. A work order is part of the Contract.
- 3.155. **Written Notice.** Written notice is considered to have been duly given if delivered in person to the individual or member to whom it is intended or if sent by regular, registered, or certified mail and delivered to the last known business address; sent by facsimile to the last known phone number; or sent by e-mail to the last known address. The date of the letter will serve as the beginning day of notice. Unclaimed mail or failure to provide current contact information will not be considered a failure to provide written notice.

Item 105

Removing Treated and Untreated Base and Asphalt Pavement



1. DESCRIPTION

Break, remove, and store or dispose of existing asphalt pavement, including surface treatments, and treated or untreated base materials.

2. CONSTRUCTION

Break material retained by the Department into pieces not larger than 24 in. unless otherwise shown on the plans. Remove existing asphalt pavement before disturbing stabilized base. Avoid contamination of the asphalt materials and damage to adjacent areas. Repair material damaged by operations outside the designated locations.

Stockpile materials designated salvageable at designated sites when shown on the plans or as directed. Prepare stockpile site by removing vegetation and trash and by providing for proper drainage. Material not designated to be salvaged will become the property of the Contractor. When this material is disposed of, do so in accordance with federal, state, and local regulations.

3. MEASUREMENT

This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard of existing treated or untreated base and asphalt pavement in its original position, or by the cubic yard of existing treated or untreated base and asphalt pavement in its original position, as calculated by the average end area method. Square yard and cubic yard measurement will be established by the widths and depths shown on the plans and the lengths measured in the field.

4. PAYMENT

The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Treated and Untreated Base and Asphalt Pavement" of the depth specified. This price is full compensation for breaking the material, loading, hauling, unloading, stockpiling or disposing; repair to areas outside designated locations for removal; and equipment, labor, tools, and incidentals.

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.

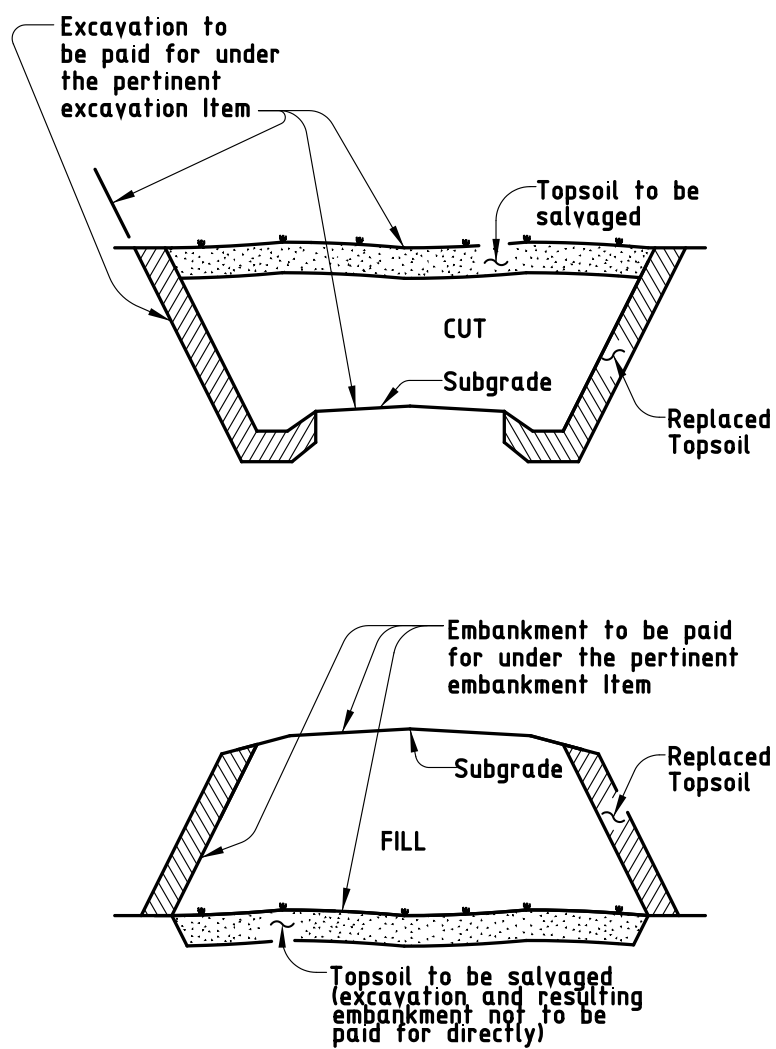


Figure 1
Roadway Cross-Sections Showing Payment for Excavation and Embankment

Item 162

Sodding for Erosion Control



1. DESCRIPTION

Provide and install grass sod as shown on the plans or as directed.

2. MATERIALS

Use live, growing grass sod of the type specified on the plans. Use grass sod with a healthy root system and dense matted roots throughout the soil of the sod for a minimum thickness of 1 in. Do not use sod from areas where the grass is thinned out. Keep sod material moist from the time it is dug until it is planted. Grass sod with dried roots is unacceptable.

- 2.1. **Block Sod.** Use block, rolled, or solid sod free from noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.
- 2.2. **Mulch Sod.** Use mulch sod from an approved source, free from noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.
- 2.3. **Fertilizer.** Furnish fertilizer in accordance with Article 166.2., "Materials."
- 2.4. **Water.** Furnish water in accordance with Article 168.2., "Materials."
- 2.5. **Mulch.** Use straw mulch consisting of oat, wheat, or rice straw or hay mulch of either Bermudagrass or prairie grasses. Use straw or hay mulch free of Johnson grass and other noxious and foreign materials. Keep the mulch dry and do not use molded or rotted material.
- 2.6. **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 sod. Plant the sod specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans. Apply fertilizer uniformly over the entire area in accordance with Article 166.3., "Construction," and water in accordance with Article 168.3., "Construction." Plant between the average date of the last freeze in the Spring and 6 weeks before the average date for the first freeze in the Fall according to the Texas Almanac for the project area.

3.1. Sodding Types.

- 3.1.1. **Spot Sodding.** Use only Bermudagrass sod. Create furrows parallel to the roadway, approximately 5 in. deep and on 18-in. centers. Sod a continuous row not less than 3 in. wide in the 2 furrows adjacent to the roadway. Place 3-in. squares of sod on 15-in. centers in the remaining furrows. Place sod so that the root system will be completely covered by the soil. Firm all sides of the sod with the soil without covering the sod with soil.
- 3.1.2. **Block Sodding.** Place sod over the prepared area. Roll or tamp the sodded area to form a thoroughly compacted, solid mat filling all voids in the sodded area with additional sod. Trim and remove all visible netting and backing materials. Keep sod along edges of curbs, driveways, walkways, etc., trimmed until acceptance.

- 3.1.3. **Mulch Sodding.** Mow sod source to no shorter than 4 in., rake and remove cuttings. Disk the sod in 2 directions, cutting the sod to a minimum of 4 in. Excavate the sod material to a depth of no more than 6 in. Keep excavated material moist or it will be rejected. Distribute the mulch sod uniformly over the area to a depth of 6 in. loose, unless otherwise shown on the plans, and roll with a light roller or other suitable equipment.
- Add or reshape the mulch sod to meet the requirements of Section 162.3.2., "Finishing."
- 3.2. **Finishing.** Smooth and shape the area after planting to conform to the desired cross-sections. Spread any excess soil uniformly over adjacent areas or dispose of the excess soil as directed.
- 3.3. **Straw or Hay Mulch.** Apply straw or hay mulch for "Spot Sodding" and "Mulch Sodding" uniformly over the area as shown on the plans. Apply straw mulch at 2 to 2-1/2 tons per acre. Apply hay mulch at 1-1/2 to 2 tons per acre. Use a tacking method over the mulched area.

4. MEASUREMENT

"Spot Sodding," "Block Sodding," and "Straw or Hay Mulch" will be measured by the square yard in its final position. "Mulch Sodding" will be measured by the square yard in its final position or by the cubic yard in vehicles as delivered to the planting site.

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 "Spot Sodding," "Block Sodding," "Straw or Hay Mulch," or "Mulch Sodding." This price is full compensation for securing a source, excavation, loading, hauling, placing, rolling, finishing, furnishing materials, equipment, labor, tools, supplies, and incidentals. Fertilizer will not be paid for directly but will be subsidiary to this Item.

Unless otherwise specified on the plans, water, except for that used for maintaining and preparing the sod before planting, will be measured and paid for in accordance with Item 168, "Vegetative Watering."

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 KNO₃ (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		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
1 (Paris) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.2	Bermudagrass	1.5
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.7	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.8
			Partridge Pea	1.0
2 (Ft. Worth) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Slender Grama (Dilley)	1.0
	Little Bluestem (OK Select)	0.8	Sand Lovegrass (Mason)	0.2
	Purple Prairie Clover (Cuero)	0.6	Sand Dropseed (Borden County)	0.2
	Engelmann Daisy (Eldorado)	0.75	Partridge Pea (Comanche)	0.6
	Illinois Bundleflower	1.3	Little Bluestem (OK Select)	0.8
	Awnless Bushsunflower (Plateau)	0.2	Engelmann Daisy (Eldorado)	0.75
			Purple Prairie Clover	0.3
3 (Wichita Falls) Feb. 1–May 15	Green Sprangletop (Van Horn)	0.6	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Sand Lovegrass (Mason)	0.2
	Little Bluestem (OK Select)	0.8	Sand Dropseed (Borden County)	0.2
	Blue Grama (Hachita)	0.4	Partridge Pea (Comanche)	0.6
	Western Wheatgrass (Barton)	1.2	Little Bluestem (OK Select)	0.8
	Galleta Grass (Viva)	0.6	Engelmann Daisy (Eldorado)	0.75
	Engelmann Daisy (Eldorado)	0.75	Purple Prairie Clover (Cuero)	0.3
	Awnless Bushsunflower (Plateau)	0.2		
4 (Amarillo) Feb. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairie Clover	0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
5 (Lubbock) Feb. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed (Borden Co.)	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairie Clover	0.5
6 (Odessa) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	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		
7 (San Angelo) Feb. 1–May 1	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Sand Lovegrass (Mason)	0.2
	Little Bluestem (OK Select)	0.4	Sand Dropseed (Borden County)	0.2
	Blue Grama (Hachita)	0.4	Sand Bluestem (Cottle County)	1.2
	Western Wheatgrass (Barton)	1.2	Partridge Pea (Comanche)	0.6
	Galleta Grass (Viva)	0.6	Little Bluestem (OK Select)	0.8
	Engelmann Daisy (Eldorado)	0.75	Engelmann Daisy (Eldorado)	0.75
	Illinois Bundleflower (Sabine)	1.0	Purple Prairie Clover (Cuero)	0.3
8 (Abilene) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Sand Lovegrass (Mason)	0.2
	Little Bluestem (OK Select)	0.4	Sand Dropseed (Borden County)	0.2
	Blue Grama (Hachita)	0.4	Sand Bluestem (Cottle County)	1.2
	Western Wheatgrass (Barton)	1.2	Partridge Pea (Comanche)	0.6
	Galleta Grass (Viva)	0.6	Little Bluestem (OK Select)	0.8
	Engelmann Daisy (Eldorado)	0.75	Engelmann Daisy (Eldorado)	0.75
	Illinois Bundleflower (Sabine)	1.0	Purple Prairie Clover (Cuero)	0.3
9 (Waco) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Slender Grama (Dilley)	1.0
	Little Bluestem (OK Select)	0.8	Sand Lovegrass (Mason)	0.2
	Purple Prairie Clover (Cuero)	0.6	Sand Dropseed (Borden County)	0.2
	Engelmann Daisy (Eldorado)	0.75	Partridge Pea (Comanche)	0.6
	Illinois Bundleflower	1.3	Little Bluestem (OK Select)	0.8
	Awnless Bushsunflower (Plateau)	0.2	Engelmann Daisy (Eldorado)	0.75
			Purple Prairie Clover	0.3
10 (Tyler) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	1.8
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Weeping Lovegrass (Ermelo)	0.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.5
			Lance-Leaf Coreopsis	1.0
11 (Lufkin) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	2.1
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Sand Lovegrass	0.5
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
12 (Houston) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.1	Bermudagrass	2.4
	Sideoats Grama (Haskell)	3.2	Bahiagrass (Pensacola)	10.5
	Little Bluestem (Native)	1.4	Weeping Lovegrass (Ermelo)	1.0
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0
13 (Yoakum) Jan. 15–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Hooded Windmillgrass (Mariah)	0.4
	Texas Grama (Atascosa)	1.5	Slender Grama (Dilley)	1.0
	Slender Grama (Dilley)	1.0	Hairy Grama (Chaparral)	0.8
	Shortspike Windmillgrass (Welder)	0.3	Shortspike Windmillgrass (Welder)	0.2
	Halls Panicum (Oso)	0.2	Purple Prairie Clover (Cuero)	0.6
	Plains Bristlegrass (Catarina Blend)	0.2	Partridge Pea (Comanche)	0.6
	Canada Wildrye (Lavaca)	2.0	Englemann Daisy (Eldorado)	1.0
	Illinois Bundleflower (Sabine)	1.3		
	Purple Prairie Clover (Cuero)	0.6		
14 (Austin) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Slender Grama (Dilley)	1.0
	Little Bluestem (OK Select)	0.8	Sand Lovegrass (Mason)	0.2
	Purple Prairie Clover (Cuero)	0.6	Sand Dropseed (Borden County)	0.2
	Engelmann Daisy (Eldorado)	0.75	Partridge Pea (Comanche)	0.6
	Illinois Bundleflower (Sabine)	1.3	Little Bluestem (OK Select)	0.8
	Awnless Bushsunflower (Plateau)	0.2	Englemann Daisy (Eldorado)	0.75
			Purple Prairie Clover	0.3
15 (San Antonio) Feb. 1–May 1	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Slender Grama (Dilley)	2.0
	Texas Grama (Atascosa)	1.0	Hairy Grama (Chaparral)	0.6
	Slender Grama (Dilley)	1.0	Shortspike Windmillgrass (Welder)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Pink Pappusgrass (Maverick)	0.6
	Pink Pappusgrass (Maverick)	0.6	Plains Bristlegrass (Catarina Blend)	0.2
	Halls Panicum (Oso)	0.2	Hooded Windmillgrass (Mariah)	0.3
	Plains Bristlegrass (Catarina Blend)	0.2	Multi-flowered False Rhodes Grass	0.1
	False Rhodes Grass (Kinney)	0.1	(Hidalgo)	0.2
	Hooded Windmillgrass (Mariah)	0.2	Arizona Cottontop (La Salle)	
	Arizona Cottontop (La Salle)	0.2		
16 (Corpus Christi) Jan. 1–May 1	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Slender Grama (Dilley)	2.0
	Texas Grama (Atascosa)	1.0	Hairy Grama (Chaparral)	0.6
	Slender Grama (Dilley)	1.0	Shortspike Windmillgrass (Welder)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Pink Pappusgrass (Maverick)	0.6
	Pink Pappusgrass (Maverick)	0.6	Plains Bristlegrass (Catarina Blend)	0.2
	Halls Panicum (Oso)	0.2	Hooded Windmillgrass (Mariah)	0.3
	Plains Bristlegrass (Catarina Blend)	0.2	Multi-flowered False Rhodes Grass	0.1
	False Rhodes Grass (Kinney)	0.1	(Hidalgo)	0.2
	Hooded Windmillgrass (Mariah)	0.2	Arizona Cottontop (La Salle)	
	Arizona Cottontop (La Salle)	0.2		
17 (Bryan) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.5	Bermudagrass	1.5
	Sideoats Grama (Haskell)	3.6	Bahiagrass (Pensacola)	7.5
	Little Bluestem (Native)	1.7	Weeping Lovegrass (Ermelo)	0.6
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
18 (Dallas) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Slender Grama (Dilley)	1.0
	Little Bluestem (OK Select)	0.8	Sand Lovegrass (Mason)	0.2
	Purple Prairie Clover (Cuero)	0.6	Sand Dropseed (Borden County)	0.2
	Engelmann Daisy (Eldorado)	0.75	Partridge Pea (Comanche)	0.6
	Illinois Bundleflower	1.3	Little Bluestem (OK Select)	0.8
	Awnless Bushsunflower (Plateau)	0.2	Engelmann Daisy (Eldorado)	0.75
19 (Atlanta) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	2.1
	Sideoats Grama (Haskell)	4.5	Bahiagrass (Pensacola)	7.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0
20 (Beaumont) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.7	Bermudagrass	2.1
	Sideoats Grama (Haskell)	4.1	Bahiagrass (Pensacola)	7.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.6
			Lance-Leaf Coreopsis	1.0
21 (Pharr) Jan. 15–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Slender Grama (Dilley)	2.0
	Texas Grama (Atascosa)	1.0	Hairy Grama (Chaparral)	0.6
	Slender Grama (Dilley)	1.0	Shortspike Windmillgrass (Welder)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Pink Pappusgrass (Maverick)	0.6
	Pink Pappusgrass (Maverick)	0.6	Plains Bristlegrass (Catarina Blend)	0.2
	Halls Panicum (Oso)	0.2	Hooded Windmillgrass (Mariah)	0.3
	Plains Bristlegrass (Catarina Blend)	0.2	Multi-flowered False Rhoades Grass	0.1
	False Rhodes Grass (Kinney)	0.1	(Hidalgo)	0.2
	Hooded Windmillgrass (Mariah)	0.2	Arizona Cottontop (La Salle)	
	Arizona Cottontop (La Salle)	0.2		
22 (Laredo) Jan. 15–May 1	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (South Texas)	1.0	Slender Grama (Dilley)	2.0
	Texas Grama (Atascosa)	1.0	Hairy Grama (Chaparral)	0.6
	Slender Grama (Dilley)	1.0	Shortspike Windmillgrass (Welder)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Pink Pappusgrass (Maverick)	0.6
	Pink Pappusgrass (Maverick)	0.6	Plains Bristlegrass (Catarina Blend)	0.2
	Halls Panicum (Oso)	0.2	Hooded Windmillgrass (Mariah)	0.3
	Plains Bristlegrass (Catarina Blend)	0.2	Multi-flowered False Rhoades Grass	0.1
	False Rhodes Grass (Kinney)	0.1	(Hidalgo)	0.2
	Hooded Windmillgrass (Mariah)	0.2	Arizona Cottontop (La Salle)	
	Arizona Cottontop (La Salle)	0.2		
23 (Brownwood) Feb. 1–May 15	Green Sprangletop (Van Horn)	0.6	Green Sprangletop (Van Horn)	1.0
	Sideoats Grama (Haskell)	1.0	Hooded Windmillgrass (Mariah)	0.2
	Texas Grama (Atascosa)	1.0	Shortspike Windmillgrass (Welder)	0.2
	Hairy Grama (Chaparral)	0.4	Hairy Grama (Chaparral)	0.4
	Shortspike Windmillgrass (Welder)	0.2	Sand Lovegrass (Mason)	0.2
	Little Bluestem (OK Select)	0.8	Sand Dropseed (Borden County)	0.2
	Blue Grama (Hachita)	0.4	Partridge Pea (Comanche)	0.6
	Western Wheatgrass (Barton)	1.2	Little Bluestem (OK Select)	0.8
	Galleta Grass (Viva)	0.6	Engelmann Daisy (Eldorado)	0.75
	Engelmann Daisy (Eldorado)	0.75	Purple Prairie Clover (Cuero)	0.3
	Awnless Bushsunflower (Plateau)	0.2		

Table 1 (continued)

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Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
24 (El Paso) Feb. 1–May 15	Green Sprangletop (Van Horn)	1.0	Green Sprangletop (Van Horn)	1.0
	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
25 (Childress) Feb. 1–May 15	Arizona Cottontop (La Salle)	0.2		
	Green Sprangletop	0.3	Green Sprangletop	0.3
	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		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
1 (Paris) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
2 (Ft. Worth) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 1–May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	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) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	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		Sandy Soils	
	Species and Rates (lb. PLS/acre)		Species and Rates (lb. PLS/acre)	
9 (Waco) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Sideoats Grama (Haskell)	4.5	Sand Dropseed (Borden Co.)	0.4
10 (Tyler) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
11 (Lufkin) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
12 (Houston) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
13 (Yoakum) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
14 (Austin) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	4.8
	Sideoats Grama (South Texas)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
15 (San Antonio) Feb. 1–May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
16 (Corpus Christi) Jan. 1–May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
17 (Bryan) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
18 (Dallas) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed (Borden Co.)	0.4
19 (Atlanta) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
20 (Beaumont) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
21 (Pharr) Jan. 15–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed (Borden Co.)	0.4
22 (Laredo) Jan. 15–May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	4.5	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	1.8	Sand Dropseed	0.4
23 (Brownwood) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Bermudagrass	1.2	Bermudagrass	3.6
	Blue Grama (Hachita)	0.9	Sand Dropseed (Borden Co.)	0.4
24 (El Paso) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (South Texas)	3.6	Buffalograss (Texoka)	1.6
	Blue Grama (Hachita)	1.2	Sand Dropseed (Borden Co.)	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	1.8
25 (Childress) Feb. 1–May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sand Dropseed (Borden Co.)	0.4
	Blue Grama (Hachita)	1.2	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	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 4.5 Western Wheatgrass 5.6 Wheat (Red, Winter) 34
Odessa (6), San Angelo (7), El Paso (24)	September 1–November 30	Western Wheatgrass 8.4 Wheat (Red, Winter) 50
Waco (9), Tyler (10), Lufkin (11), Austin (14), San Antonio (15), Bryan (17), Atlanta (19)	September 1–November 30	Tall Fescue 4.5 Oats 24 Wheat 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 4.5 Western Wheatgrass 5.6 Cereal Rye 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 166

Fertilizer



1. DESCRIPTION

Provide and distribute fertilizer over areas specified on the plans.

2. MATERIALS

Use a complete fertilizer containing nitrogen (N), phosphoric acid (P), and potash (K) nutrients unless otherwise specified on the plans. Ensure at least 50% of the nitrogen component is a slow-release sulfur-coated urea. Ensure that fertilizer is in an acceptable condition for distribution in containers labeled with the analysis. Fertilizer is subject to testing by the Texas A&M Feed and Fertilizer Control Service in accordance with the Texas Fertilizer Law.

3. CONSTRUCTION

Deliver and apply the complete fertilizer uniformly at a rate equal to 60 lb. of nitrogen per acre or at the analysis and rate specified on the plans.

Apply fertilizer as a dry material and do not mix with water to form a slurry.

Incorporate fertilizer during seedbed preparation as specified on the plans.

4. MEASUREMENT

When fertilizer is specified on the plans to be a pay item, measurement will be by the acre of surface area covered or by the ton (2,000 lb.). Measurement by the ton will use guaranteed weight of bags or containers as shown by the manufacturer or certified scales meeting the requirements of Item 520, "Weighing and Measuring Equipment," unless otherwise approved.

5. PAYMENT

Unless otherwise specified on the plans, the work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly but will be subsidiary to pertinent bid items.

When fertilizer is specified on the plans to be a pay item, 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 "Fertilizer." This price is full compensation for furnishing materials and performing operations.

Item 168

Vegetative Watering



1. DESCRIPTION

Provide and distribute water to promote growth of vegetation as directed.

2. MATERIALS

Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

3. CONSTRUCTION

Apply water when directed. Furnish and operate equipment to distribute water at a uniform and controllable rate. Ensure that watering does not erode soil or plantings. Apply water in the required quantity where shown on the plans or as directed.

4. MEASUREMENT

This Item will be measured by the 1,000 gal. as applied.

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 "Vegetative Watering." This price is full compensation for furnishing and operating watering equipment and measuring devices and for furnishing and applying water, including hauling, equipment, labor, and incidentals.

Item 204

Sprinkling



1. DESCRIPTION

Apply water for dust control, earthwork, or base construction.

2. MATERIALS

Furnish water free of industrial wastes and other objectionable matter.

3. EQUIPMENT

Use sprinklers and spray bars equipped with positive and rapidly working cut-off valves.

4. CONSTRUCTION

Apply water at a uniform rate and in the required quantity, or as directed.

5. MEASUREMENT

This Item will be measured by the 1,000 gal. applied.

6. PAYMENT

Unless sprinkling is specified as a pay item, the work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

When sprinkling is specified on the plans as a pay item, the work performed and water furnished will be paid for at the unit price bid for "Sprinkling (Base)," "Sprinkling (Earthwork)," or "Sprinkling (Dust Control)." This price is full compensation for furnishing and applying water; furnishing and operating sprinklers and measuring devices; and hauling, equipment, labor, fuel, materials, tools, and incidentals.

Item 210

Rolling



1. DESCRIPTION

Compact embankment, subgrade, base, surface treatments, broken concrete pavement, or asphalt pavement using rollers. Break up asphalt mats, pit run material, or base materials.

2. EQUIPMENT

Use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the plans or directed. Use equipment that meets the requirements of this Item when specific types of equipment are required. The Engineer may allow the use of rollers that operate in one direction only when turning does not affect the quality of work or encroach on traffic.

Table 1
Roller Requirements¹

Roller Type	Materials to be Compacted	Load (tons)	Contact Pressure	Roller Speed (mph)
Steel wheel	Embankment, subgrade, base, asphalt concrete	≥ 10	≥ 325 lb. per inch of wheel width	2–3
Tamping	Embankment, subgrade	–	125–550 psi per tamping foot	2–3
Heavy tamping	Embankment, subgrade	–	≥ 550 psi per tamping foot	2–3
Vibratory	Embankment, subgrade, base, asphalt concrete	Type A < 6 Type B > 6 Type C as shown on the plans	Per equipment specification and as approved	As approved
Light pneumatic	Embankment, subgrade, surface treatment	4.5–9.0	≥ 45 psi	2–6
	Asphalt Concrete			4–12
Medium pneumatic	Embankment, subgrade, base, surface treatment	12–25	≥ 80 psi, as directed	2–6
	Asphalt Concrete			4–12
Heavy pneumatic	Embankment, subgrade, base, previously broken concrete pavement, other pavements	≥ 25	≤ 150 psi	2–6
Grid	Embankment, breaking up existing asphalt mats or base	5–13	–	2–3

1. Unless otherwise specified in the Contract.

- 2.1. **Static Steel Wheel Rollers.** Furnish single, double, or triple steel wheel, self-propelled power rollers weighing at least 10 tons capable of operating in a forward and backward motion. Ensure all wheels are flat. The Contractor may use vibratory rollers in the static mode when static steel wheel rollers are required.

For single steel wheel rollers, pneumatic rear wheels are allowed for embankment, subgrade, and base. Provide rear wheels for triple steel wheel rollers with a minimum diameter of 48 in., a minimum width of 20 in., and a minimum compression of 325 lb. per inch of wheel width.

- 2.2. **Tamping Rollers.** Furnish self-propelled rollers with at least one self-cleaning metal tamping drum capable of operating in a forward or backward motion with a minimum effective rolling width of 5 ft. Mount drums in a frame so that each drum moves independently of the other for rollers with more than one drum. Operate rollers in static or vibratory mode.

- 2.2.1. **Tamping Roller (Minimum Requirement).** Provide tamping feet that exert a static load of 125 to 550 psi and project at least 3 in. from the surface of the drum for all tamping rollers except for heavy tamping rollers.

- 2.2.2. **Heavy Tamping Roller.** Provide tamping rollers that have:

- 2 metal tamping drums, rolls, or shells, each with a 60-in. minimum diameter and a 5-ft. minimum width, or
- 1 rear and 2 forward drums, each with a 60-in. minimum diameter. Arrange drums so that the rear drum compacts the space between the 2 forward drums and the minimum overall rolling width is 10 ft.

Equip drums with tamping feet that:

- project at least 7 in. from the drum surface,
- have an area of 7 to 21 sq. in.,
- are self-cleaning,
- exert a static load of at least 550 psi, and
- are spaced at 1 tamping foot per 0.65 to 0.70 square feet of drum area.

- 2.3. **Vibratory Rollers.** Furnish self-propelled rollers with at least one drum equipped to vibrate. Select and maintain amplitude and frequency settings per manufacturer's specifications to deliver maximum compaction without material displacement or shoving, as approved. Furnish the equipment manufacturer's specifications concerning settings and controls for amplitude and frequency. Operate rollers at speeds that will produce at least 10 blows per foot unless otherwise shown on the plans or approved. Pneumatic rear wheels are allowed for embankment, subgrade, and base. Equip each vibrating drum with:

- separate frequency and amplitude controls,
- controls to manually start and stop vibration, and
- a mechanism to continuously clean the face of the drum.

For asphalt-stabilized base and asphalt concrete pavement, furnish a roller that also has the ability to:

- automatically reverse the direction of the rotating eccentric weight,
- stop vibration before the motion of the roller stops, and
- thoroughly moisten the drum with water or approved asphalt release agent.

- 2.3.1. **Drum (Type A).** Furnish a roller with a static weight less than 6 tons and a vibratory drum.

- 2.3.2. **Drum (Type B).** Furnish a roller with a minimum static weight of 6 tons and a vibratory drum.

- 2.3.3. **Drum (Type C).** Furnish a roller as shown on the plans.

- 2.4. **Pneumatic Tire Rollers.** Pneumatic tire rollers consist of rubber tire wheels on axles mounted in a frame with either a loading platform or body suitable for ballast loading. Arrange the rear tires to cover the gaps between adjacent tires of the forward group. Furnish rollers capable of forward and backward motion.

Compact asphalt pavements and surface treatments with a roller equipped with smooth-tread tires. Compact without damaging the surface. Moisten the wheels with water or an approved asphalt release agent when necessary.

Select and maintain the operating load and tire air pressure within the range of the manufacturer's charts or tabulations to attain maximum compaction throughout the lift, as approved. Furnish the manufacturer's chart or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished. Maintain individual tire inflation pressures within 5 psi of each other. Provide uniform compression under all tires.

2.4.1. **Light Pneumatic Tire.** Furnish a unit:

- with at least 9 pneumatic tires,
- with an effective rolling width of approximately 5 ft.,
- capable of providing a total uniform load of 4.5 to 9 tons, and
- with tires capable of maintaining a minimum ground contact pressure of 45 psi.

2.4.2. **Medium Pneumatic Tire.** Furnish a unit:

- with at least 7 pneumatic tires,
- with an effective rolling width of approximately 7 ft.,
- capable of providing a total uniform load of 12 to 25 tons, and
- with tires capable of maintaining a minimum ground contact pressure of 80 psi or 90 psi as directed.

2.4.3. **Heavy Pneumatic Tire.** Furnish a unit:

- with at least 4 pneumatic-tired wheels mounted on axles carrying no more than 2 wheels,
- with wheels arranged to carry approximately equal loads on uneven surfaces,
- with a width between 8 and 10 ft. that can turn 180° in the crown width,
- capable of providing a total uniform load of at least 25 tons,
- with tires capable of maintaining a maximum ground contact pressure of 150 psi, and
- with liquid-filled tires inflated to such a level that liquid will flow from the valve stem when the stem is in the uppermost position.

2.5. **Grid Rollers.** Furnish rollers that have 2 cylindrical cages with a minimum diameter of 66 in. and a minimum width of 32 in. Mount cages in a rigid frame with weight boxes. Use a cage surface of cast or welded steel fabric grid with bars 1-1/2 in. wide, spaced on 5-in. centers in each direction, that undulate approximately 1 in. between the high and low points.

Furnish rollers capable of providing a total load of 5 to 13 tons and capable of being operated in a forward or backward motion.

2.6. **Alternate Equipment.** The Contractor may use alternate compaction equipment that produces results equivalent to the specified equipment as approved. Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.

3. CONSTRUCTION

Perform this work in accordance with the applicable Items using equipment and roller speeds specified in Table 1. Use only rubber-tired equipment to push or pull compaction equipment on base courses. Use equipment that does not damage material being rolled.

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 subsidiary to pertinent Items.

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 247

Flexible Base



1. DESCRIPTION

Construct a foundation course composed of flexible base.

2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. Use [Tex-100-E](#) material definitions.

- 2.1. **Aggregate.** Furnish aggregate of the type and grade shown on the plans and meeting the requirements of Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives, such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1 unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1-2	Grade 3	Grade 4 ²	Grade 5
Sampling	Tex-400-A				
Master gradation sieve size (cumulative % retained)	Tex-110-E			As shown on the plans	
2-1/2"		0	0		0
1-3/4"		0-10	0-10		0-5
7/8"		10-35	-		10-35
3/8"		30-65	-		35-65
#4		45-75	45-75		45-75
#40		65-90	50-85		70-90
Liquid Limit, % Max	Tex-104-E	40	40	As shown on the plans	35
Plasticity Index, Max ¹	Tex-106-E	10	12	As shown on the plans	10
Plasticity index, Min ¹		As shown on the plans	As shown on the plans	As shown on the plans	As shown on the plans
Wet ball mill, % Max	Tex-116-E	40	-	As shown on the plans	40
Wet ball mill, % Max increase passing the #40 sieve		20	-	As shown on the plans	20
Min compressive strength, psi	Tex-117-E			As shown on the plans	
lateral pressure 0 psi		35	-		-
lateral pressure 3 psi		-	-		90
lateral pressure 15 psi		175	-		175

- Determine plastic index in accordance with [Tex-107-E](#) (linear shrinkage) when liquid limit is unattainable as defined in [Tex-104-E](#).
- Grade 4 may be further designated as Grade 4A, Grade 4B, etc.

- 2.1.1. **Material Tolerances.** The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.

When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.

The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

- 2.1.2. **Material Types.** Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following:
- 2.1.2.1. **Type A.** Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.
- 2.1.2.2. **Type B.** Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.
- 2.1.2.3. **Type C.** Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by [Tex-460-A](#), Part I. Blending of 2 or more sources is allowed.
- 2.1.2.4. **Type D.** Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements in Section 247.2.1.3.2., "Recycled Material (Including Crushed Concrete) Requirements," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.
- 2.1.2.5. **Type E.** Caliche, iron ore or as otherwise shown on the plans.
- 2.1.3. **Recycled Material.** Reclaimed asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.
- 2.1.3.1. **Limits on Percentage.** Do not exceed 20% RAP by weight, when RAP is allowed, unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.
- 2.1.3.2. **Recycled Material (Including Crushed Concrete) Requirements.**
- 2.1.3.2.1. **Contractor-Furnished Recycled Materials.** Provide recycled materials, other than RAP, that have a maximum sulfate content of 3,000 ppm when tested in accordance with [Tex-145-E](#). When the Contractor furnishes the recycled materials, including crushed concrete, the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with [DMS-11000](#), "Evaluating and Using Nonhazardous Recyclable Materials Guidelines," for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with [Tex-413-A](#). For RAP, do not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with [Tex-406-A](#). Test RAP without removing the asphalt.
- 2.1.3.2.2. **Department-Furnished Required Recycled Materials.** When the Department furnishes and requires the use of recycled materials, unless otherwise shown on the plans:
- Department-required recycled material will not be subject to the requirements in Table 1,
 - Contractor-furnished materials are subject to the requirements in Table 1 and this Item,
 - the final product, blended, will be subject to the requirements in Table 1, and
 - for final product, unblended (100% Department-furnished required recycled material), the liquid limit, plasticity index, wet ball mill, and compressive strength is waived.
- Crush Department-furnished RAP so that 100% passes the 2 in. sieve. The Contractor is responsible for uniformly blending to meet the percentage required.
- 2.1.3.2.3. **Department-Furnished and Allowed Recycled Materials.** When the Department furnishes and allows the use of recycled materials or allows the Contractor to furnish recycled materials, the final blended product is subject to the requirements of Table 1 and the plans.

- 2.1.3.3. **Recycled Material Sources.** Department-owned recycled material is available to the Contractor only when shown on the plans. Return unused Department-owned recycled materials to the Department stockpile location designated by the Engineer unless otherwise shown on the plans.

The use of Contractor-owned recycled materials is allowed when shown on the plans. Contractor-owned surplus recycled materials remain the property of the Contractor. Remove Contractor-owned recycled materials from the project and dispose of them in accordance with federal, state, and local regulations before project acceptance. Do not intermingle Contractor-owned recycled material with Department-owned recycled material unless approved.

- 2.2. **Water.** Furnish water free of industrial wastes and other objectionable matter.
- 2.3. **Material Sources.** Expose the vertical faces of all strata of material proposed for use when non-commercial sources are used. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

- 3.1. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.
- 3.2. When ride quality measurement is required, provide a high speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute. Provide equipment certification documentation. Display a current decal on the equipment indicating the certification expiration date.

4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise approved. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.

Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Charges for additional sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in accordance with the applicable Items.

- 4.1. **Preparation of Subgrade or Existing Base.** Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Treated and Untreated Base and Asphalt Pavement," when shown on the plans or as directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed.

When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

Proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying when shown on the plans or directed. Correct soft spots as directed.

- 4.2. **Placing.** Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed, at no additional expense to the Department.

Place successive base courses and finish courses using the same construction methods required for the first course.

- 4.3. **Compaction.** Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling."

Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit. Begin rolling at the low side and progress toward the high side on superelevated curves. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish requirements before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

Before final acceptance, the Engineer will select the locations of tests and measure the flexible base depth in accordance with [Tex-140-E](#). Correct areas deficient by more than 1/2 in. in thickness by scarifying, adding material as required, reshaping, recompact, and refinishing at the Contractor's expense.

- 4.3.1. **Ordinary Compaction.** Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompact.

- 4.3.2. **Density Control.** Compact to at least 100% of the maximum dry density determined by [Tex-113-E](#), unless otherwise shown on the plans. Maintain moisture during compaction within ± 2 percentage points of the optimum moisture content as determined by [Tex-113-E](#). Measure the moisture content of the material in accordance with [Tex-115-E](#) or [Tex-103-E](#) during compaction daily and report the results the same day to the Engineer, unless otherwise shown on the plans or directed. Do not achieve density by drying the material after compaction.

The Engineer will determine roadway density and moisture content of completed sections in accordance with [Tex-115-E](#). The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

- 4.4. **Finishing.** After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the plans or as directed.

Correct grade deviations greater than 1/4 in. in 16 feet measured longitudinally or greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Correct by loosening and adding, or removing material. Reshape and re-compact in accordance with Section 247.4.3., "Compaction."

- 4.5. **Curing.** Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.

- 4.6. **Ride Quality.** This section applies to the final travel lanes that receive a 1 or 2 course surface treatment for the final surface, unless otherwise shown on the plans. Measure ride quality of the base course after placement of the prime coat and before placement of the surface treatment, unless otherwise approved. Use a certified profiler operator from the Department's MPL. When requested, furnish the Engineer documentation for the person certified to operate the profiler.

Provide all profile measurements to the Engineer in electronic data files within 3 days after placement of the prime coat using the format specified in [Tex-1001-S](#). The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi.sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheel path, unless otherwise shown on the plans.

Re-profile and correct sections that fail to maintain ride quality until placement of the next course, as directed. Correct re-profiled sections until specification requirements are met, as approved. Perform this work at no additional expense to the Department.

5. MEASUREMENT

Flexible base will be measured as follows:

- **Flexible Base (Complete In Place).** The ton, square yard, or any cubic yard method.
- **Flexible Base (Roadway Delivery).** The ton or any cubic yard method.
- **Flexible Base (Stockpile Delivery).** The ton, cubic yard in vehicle, or cubic yard in stockpile.

Measurement by the cubic yard in final position and square yard is a plans quantity measurement. The quantity to be paid for 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.

Measurement is further defined for payment as follows.

- 5.1. **Cubic Yard in Vehicle.** By the cubic yard in vehicles of uniform capacity at the point of delivery.
- 5.2. **Cubic Yard in Stockpile.** By the cubic yard in the final stockpile position by the method of average end areas.
- 5.3. **Cubic Yard in Final Position.** By the cubic yard in the completed and accepted final position. The volume of base course is computed in place by the method of average end areas between the original subgrade or existing base surfaces and the lines, grades, and slopes of the accepted base course as shown on the plans.
- 5.4. **Square Yard.** By the square yard of surface area in the completed and accepted final position. The surface area of the base course is based on the width of flexible base as shown on the plans.
- 5.5. **Ton.** By the ton of dry weight in vehicles as delivered. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with [Tex-103-E](#) from samples taken at the time of weighing.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."

6. 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 types of work shown below. No additional payment

will be made for thickness or width exceeding that shown on the typical section or provided on the plans for cubic yard in the final position or square yard measurement.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216, "Proof Rolling."

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 pertinent Items or Article 4.4., "Changes in the Work."

- 6.1. **Flexible Base (Complete In Place).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. For square yard measurement, a depth will be specified. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping, placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- 6.2. **Flexible Base (Roadway Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- 6.3. **Flexible Base (Stockpile Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle" or "In Stockpile" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing and disposing of materials, preparing the stockpile area, temporary or permanent stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials to the stockpile, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.

Item 300

Asphalts, Oils, and Emulsions



1. DESCRIPTION

Provide asphalt cements, cutback and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphalt materials as specified on the plans.

2. MATERIALS

Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Use asphalt containing recycled materials only if the recycled components meet the requirements of Article 6.9, "Recycled Materials." Provide asphalt materials that have been preapproved for use by the Construction Division in accordance with [Tex-545-C](#).

Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex	Department
T or R	AASHTO
D	ASTM
Polymer Modifier Designations	
P	polymer-modified
SBR or L	styrene-butadiene rubber (latex)
SBS	styrene-butadiene-styrene block co-polymer
TR	tire rubber (from ambient temperature grinding of truck and passenger tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
C	cationic
EAP&T	emulsified asphalt prime and tack
H-suffix	harder residue (lower penetration)
HF	high float
MC	medium-curing
MS	medium-setting
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special cutback material
SS	slow-setting

- 2.1. **Asphalt Cement.** Provide asphalt cement that is homogeneous, water-free, and nonfoaming when heated to 347°F, and meets the requirements in Table 2.

Table 2
Asphalt Cement

Property	Test Procedure	Viscosity Grade									
		AC-0.6		AC-1.5		AC-3		AC-5		AC-10	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity 140°F, poise 275°F, poise	T 202	40 0.4	80 –	100 0.7	200 –	250 1.1	350 –	400 1.4	600 –	800 1.9	1,200 –
Penetration, 77°F, 100g, 5 sec.	T 49	350	–	250	–	210	–	135	–	85	–
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	450	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.		Neg.	
Tests on residue from Thin-Film Oven Test: Viscosity, 140°F, poise Ductility, ¹ 77°F 5 cm/min., cm	T 179 T 202 T 51	– – 100	180 – –	– 450 100	450 – –	– 900 100	900 – –	– 1,500 100	1,500 – –	– 3,000 100	3,000 – –

1. If AC-0.6 or AC-1.5 ductility at 77°F is less than 100 cm, material is acceptable if ductility at 60°F is more than 100 cm.

2.2.

Polymer-Modified Asphalt Cement. Provide polymer-modified asphalt cement that is smooth, homogeneous, and meets the requirements of Table 3. Supply samples of the base asphalt cement and polymer additives if requested.

Table 3
Polymer-Modified Asphalt Cement

Property	Test Procedure	Polymer-Modified Viscosity Grade											
		AC-5 w/2% SBR		AC-10 w/2% SBR		AC-15P		AC-20XP		AC-10-2TR		AC-20-5TR	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Polymer		SBR		SBR		SBS		SBS		TR		TR	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	2.0	–	3.0	–	–	–	2.0	–	5.0	–
Dynamic shear, G*/sin δ, 64°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	1.0	–	–	–	1.0	–
Dynamic shear, G*/sin δ, 58°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	–	–	1.0	–	–	–
Viscosity 140°F, poise 275°F, poise	T 202 T 202	700 –	– 7.0	1,300 –	– 8.0	1,500 –	– 8.0	2,000 –	– –	1,000 –	– 8.0	2,000 –	– 10.0
Penetration, 77°F, 100 g, 5 sec.	T 49	120	–	80	–	100	150	75	115	95	130	75	115
Ductility, 5cm/min., 39.2°F, cm	T 51	70	–	60	–	–	–	–	–	–	–	–	–
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	55	–	55	–	30	–	55	–
Softening point, °F	T 53	–	–	–	–	–	–	120	–	110	–	120	–
Polymer separation, 48 hr.	Tex-540-C	None		None		None		None		None		None	
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	425	–	425	–
Tests on residue from RTFOT aging and pressure aging: Creep stiffness S, -18°C, MPa m-value, -18°C	Tex-541-C and R 28 T 313	– –	– –	– –	– –	– 0.300	300 –	– 0.300	300 –	– 0.300	300 –	– 0.300	300 –

2.3.

Cutback Asphalt. Provide cutback asphalt that meets the requirements of Tables 4, 5, and 6 for the specified type and grade. Supply samples of the base asphalt cement and polymer additives if requested.

Table 4
Rapid-Curing Cutback Asphalt

Property	Test Procedure	Type-Grade					
		RC-250		RC-800		RC-3000	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	250	400	800	1,600	3,000	6,000
Water, %	D95	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	80	—	80	—	80	—
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		40	75	35	70	20	55
to 500°F		65	90	55	85	45	75
to 600°F		85	—	80	—	70	—
Residue from distillation, volume %		70	—	75	—	82	—
Tests on distillation residue:							
Viscosity, 140°F, poise	T 202	600	2400	600	2400	600	2400
Ductility, 5 cm/min., 77°F, cm	T 51	100	—	100	—	100	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—
Spot test	Tex-509-C	Neg.		Neg.		Neg.	

Table 5
Medium-Curing Cutback Asphalt

Property	Test Procedure	Type-Grade							
		MC-30		MC-250		MC-800		MC-3000	
		Min	Max	Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	30	60	250	500	800	1,600	3,000	6,000
Water, %	D95	—	0.2	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	95	—	122	—	140	—	149	—
Distillation test:	T 78								
Distillate, percentage by volume of total distillate to 680°F									
to 437°F		—	35	—	20	—	—	—	—
to 500°F		30	75	5	55	—	40	—	15
to 600°F		75	95	60	90	45	85	15	75
Residue from distillation, volume %		50	—	67	—	75	—	80	—
Tests on distillation residue:									
Viscosity, 140°F, poise	T 202	300	1200	300	1200	300	1200	300	1200
Ductility, 5 cm/min., 77°F, cm	T 51	100	—	100	—	100	—	100	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—	99.0	—
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.	

Table 6
Special-Use Cutback Asphalt

Property	Test Procedure	Type-Grade					
		MC-2400L		SCM I		SCM II	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	2,400	4,800	500	1,000	1,000	2,000
Water, %	D95	—	0.2	—	0.2	—	0.2
Flash point, T.O.C., °F	T 79	150	—	175	—	175	—
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F to 437°F		—	—	—	—	—	—
to 500°F		—	35	—	0.5	—	0.5
to 600°F		35	80	20	60	15	50
Residue from distillation, volume %		78	—	76	—	82	—
Tests on distillation residue:							
Polymer		SBR		—		—	
Polymer content, % (solids basis)	Tex-533-C	2.0	—	—	—	—	—
Penetration, 100 g, 5 sec., 77°F	T 49	150	300	180	—	180	—
Ductility, 5 cm/min., 39.2°F, cm	T 51	50	—	—	—	—	—
Solubility in trichloroethylene, %	T 44	99.0	—	99.0	—	99.0	—

2.4.

Emulsified Asphalt. Provide emulsified asphalt that is homogeneous, does not separate after thorough mixing, and meets the requirements for the specified type and grade in Tables 7, 8, 9, and 10.

Table 7
Emulsified Asphalt

Property	Test Procedure	Type-Grade									
		Rapid-Setting		Medium-Setting				Slow-Setting			
		HFRS-2		MS-2		AES-300		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	— 150	— 400	— 100	— 300	75 —	400 —	20 —	100 —	20 —	100 —
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Miscibility	T 59	—	—	—	—	—	—	Pass		Pass	
Cement mixing, %	T 59	—	—	—	—	—	—	—	2.0	—	2.0
Coating ability and water resistance:	T 59										
Dry aggregate/after spray		—	—	—	—	Good/Fair	—	—	—	—	—
Wet aggregate/after spray		—	—	—	—	Fair/Fair	—	—	—	—	—
Demulsibility, 35 mL of 0.02 N CaCl ₂ , %	T 59	50	—	—	30	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	1	—	1
Freezing test, 3 cycles ¹	T 59	—	—	Pass		—		Pass		Pass	
Distillation test:	T 59										
Residue by distillation, % by wt.		65	—	65	—	65	—	60	—	60	—
Oil distillate, % by volume of emulsion		—	0.5	—	0.5	—	5	—	0.5	—	0.5
Tests on residue from distillation:											
Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	120	160	300	—	120	160	70	100
Solubility in trichloroethylene, %	T 44	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—
Ductility, 77°F, 5 cm/min., cm	T 51	100	—	100	—	—	—	100	—	80	—
Float test, 140°F, sec.	T 50	1,200	—	—	—	1,200	—	—	—	—	—

1. Applies only when the Engineer designates material for winter use.

Table 8
Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		CRS-2		CRS-2H		CMS-2		CMS-2S		CSS-1		CSS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	—	—	—	—	—	—	—	—	20	100	20	100
		150	400	150	400	100	300	100	300	—	—	—	—
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Cement mixing, %	T 59	—	—	—	—	—	—	—	—	—	2.0	—	2.0
Coating ability and water resistance: Dry aggregate/after spray Wet aggregate/after spray	T 59	—	—	—	—	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	—	—	—	—
Demulsibility, 35 mL of 0.8% Sodium dioctyl sulfosuccinate, %	T 59	70	—	70	—	—	—	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	1	—	1	—	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test: Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	—	65	—	65	—	65	—	60	—	60	—
		—	0.5	—	0.5	—	7	—	5	—	0.5	—	0.5
Tests on residue from distillation: Penetration, 77°F, 100 g, 5 sec. Solubility in trichloroethylene, % Ductility, 77°F, 5 cm/min., cm	T 49 T 44 T 51	120 97.5 100	160 — —	70 97.5 80	110 — —	120 97.5 100	200 — —	300 97.5 —	— — —	120 97.5 100	160 — —	70 97.5 80	110 — —

Table 9
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		RS-1P		HFRS-2P		AES-150P		AES-300P		AES-300S		SS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	—	—	—	—	75	400	75	400	75	400	30	100
		50	200	150	400	—	—	—	—	—	—	—	—
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Miscibility	T 59	—		—		—		—		—		Pass	
Coating ability and water resistance: Dry aggregate/after spray Wet aggregate/after spray	T 59	—	—	—	—	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	Good/Fair Fair/Fair	—	—
Demulsibility, 35 mL of 0.02 N CaCl ₂ , %	T 59	60	—	50	—	—	—	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	1	—	1	—	1
Breaking index, g	Tex-542-C	—	80	—	—	—	—	—	—	—	—	—	—
Distillation test: ¹ Residue by distillation, % by wt. Oil distillate, % by volume of emulsion	T 59	65	—	65	—	65	—	65	—	65	—	60	—
		—	3	—	0.5	—	3	—	5	—	7	—	0.5
Tests on residue from distillation: Polymer content, wt. % (solids basis) Penetration, 77°F, 100 g, 5 sec. Solubility in trichloroethylene, % Viscosity, 140°F, poise Float test, 140°F, sec. Ductility, ² 39.2°F, 5 cm/min., cm Elastic recovery, ² 50°F, %	Tex-533-C T 49 T 44 T 202 T 50 T 51 Tex-539-C	— 225 97.0 — — — 55	— 300 — — — — —	3.0 90 97.0 1,500 1,200 50 55	— 140 — — — — —	— 150 97.0 — 1,200 — —	— 300 — — — — —	— 300 97.0 — 1,200 — — —	— — — — 1,200 — — —	— 300 97.0 — 1,200 — — —	— — — — — — —	3.0 100 97.0 1,300 — 50 —	— 140 — — — — —
Tests on RTFO curing of distillation residue Elastic recovery, 50°F, %	Tex-541-C Tex-539-C	—	—	—	—	50	—	50	—	30	—	—	—

- Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 min. (±5 min.) from the first application of heat.
- HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 10
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting						Medium-Setting				Slow-Setting	
		CRS-1P		CRS-2P		CHFRS-2P		CMS-1P ³		CMS-2P ³		CSS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	—	—	—	—	—	—	20	100	—	—	20	100
Sieve test, %	T 59	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1	—	0.1
Demulsibility, 35 mL of 0.8% Sodium dioctyl sulfosuccinate, %	T 59	60	—	70	—	60	—	—	—	—	—	—	—
Storage stability, 1 day, %	T 59	—	1	—	1	—	1	—	—	—	—	—	1
Breaking index, g	Tex-542-C	—	80	—	—	—	—	—	—	—	—	—	—
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test: ¹ Residue by distillation, % by weight Oil distillate, % by volume of emulsion	T 59	65	—	65	—	65	—	65	—	65	—	62	—
		—	3	—	0.5	—	0.5	—	0.5	—	0.5	—	0.5
Tests on residue from distillation: Polymer content, wt. % (solids basis)	Tex-533-C	—	—	3.0	—	3.0	—	—	—	—	—	3.0	—
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	150	80	130	40	—	40	—	55	90
Viscosity, 140°F, poise	T 202	—	—	1,300	—	1,300	—	—	5,000	—	5,000	—	—
Solubility in trichloroethylene, %	T 44	97.0	—	97.0	—	95.0	—	—	—	—	—	97.0	—
Softening point, °F	T 53	—	—	—	—	130	—	—	—	—	—	135	—
Ductility, 77°F, 5 cm/min., cm	T 51	—	—	—	—	—	—	—	—	—	—	70	—
Float test, 140°F, sec.	T 50	—	—	—	—	1,800	—	—	—	—	—	—	—
Ductility, ² 39.2°F, 5 cm/min., cm	T 51	—	—	50	—	—	—	—	—	—	—	—	—
Elastic recovery, ² 50°F, %	Tex-539-C	45	—	55	—	55	—	45	—	45	—	—	—
Tests on rejuvenating agent: Viscosity, 140°F, cSt	T 201	—	—	—	—	—	—	50	175	50	175	—	—
Flash point, C.O.C., °F	T 48	—	—	—	—	—	—	380	—	380	—	—	—
Saturates, % by weight	D2007	—	—	—	—	—	—	—	30	—	30	—	—
Solubility in n-pentane, % by weight	D2007	—	—	—	—	—	—	99	—	99	—	—	—
Tests on rejuvenating agent after TFO or RTFO:	T 240 or T 179												
Weight Change, %		—	—	—	—	—	—	—	6.5	—	6.5	—	—
Viscosity Ratio		—	—	—	—	—	—	—	3.0	—	3.0	—	—
Tests on latex: ⁴ Tensile strength, die C dumbbell, psi	D412 ⁵	—	—	—	—	—	—	500	—	500	—	—	—
Change in mass after immersion in rejuvenating agent, %	D471	—	—	—	—	—	—	—	40 ⁶	—	40 ⁶	—	—

- Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F (±0°F). Maintain at this temperature for 20 min. Complete total distillation in 60 min. (±5 min.) from the first application of heat.
- CRS-2P must meet one of either the ductility or elastic recovery requirements.
- With all precertification samples of CMS-1P or CMS-2P, submit certified test reports showing that the rejuvenating agent and latex meet the stated requirements. Submit samples of these raw materials if requested by the Engineer.
- Preparation of latex films: Use any substrate which produces a film of uniform cross-section. Apply latex using a drawdown tool that will deliver enough material to achieve desired residual thickness. Cure films for 14 days at 75°F and 50% relative humidity.
- Cut samples for tensile strength determination using a crosshead speed of 20 in./min.
- Specimen must remain intact after exposure and removal of excess rejuvenating agent.

- 2.5. **Specialty Emulsions.** Provide specialty emulsion that is either asphalt-based or resin-based and meets the requirements of Table 11.

Table 11
Specialty Emulsions

Property	Test Procedure	Type-Grade					
		Medium-Setting				Slow-Setting	
		AE-P		EAP&T		PCE ¹	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol 77°F, sec. 122°F, sec.	T 72	– 15	– 150	– –	– –	10 –	100 –
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1
Miscibility ²	T 59	–	–	Pass	–	Pass	–
Demulsibility, 35 mL of 0.10 N CaCl ₂ , %	T 59	–	70	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	–
Particle size, ⁵ % by volume < 2.5 µm	Tex-238-F³	–	–	90	–	90	–
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F: Residue after both distillations, % by wt. Total oil distillate from both distillations, % by volume of emulsion	T 59 & T 78	40 25	– 40	– –	– –	– –	– –
Residue by distillation, % by wt.	T 59	–	–	60	–	–	–
Residue by evaporation, ⁴ % by wt.	T 59	–	–	–	–	60	–
Tests on residue after all distillation(s): Viscosity, 140°F, poise Kinematic viscosity, ⁵ 140°F, cSt Flash point C.O.C., °F Solubility in trichloroethylene, % Float test, 122°F, sec.	T 202 T 201 T 48 T 44 T 50	– – – 97.5 50	– – – – 200	800 – – – –	– – – – –	– 100 400 – –	– 350 – – –

Supply with each shipment of PCE:

- a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste;
- a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or Polychlorinated Biphenyls (PCBs) have been mixed with the product; and
- a Safety Data Sheet.

Exception to T 59: In dilution, use 350 mL of distilled or deionized water and a 1,000-mL beaker.

Use [Tex-238-F](#), beginning at "Particle Size Analysis by Laser Diffraction," with distilled or deionized water as a medium and no dispersant, or use another approved method.

Exception to T 59: Leave sample in the oven until foaming ceases, then cool and weigh.

PCE must meet either the kinematic viscosity requirement or the particle size requirement.

- 2.6. **Recycling Agent.** Recycling agent and emulsified recycling agent must meet the requirements in Table 12. Additionally, recycling agent and residue from emulsified recycling agent, when added in the specified proportions to the recycled asphalt, must meet the properties specified on the plans.

Table 12
Recycling Agent and Emulsified Recycling Agent

Property	Test Procedure	Recycling Agent		Emulsified Recycling Agent	
		Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	–	–	15	100
Sieve test, %	T 59	–	–	–	0.1
Miscibility ¹	T 59	–		No coagulation	
Residue by evaporation, ² % by wt.	T 59	–	–	60	–
Tests on recycling agent or residue from evaporation:	T 48 T 201				
Flash point, C.O.C., °F		400	–	400	–
Kinematic viscosity, 140°F, cSt		75	200	75	200
275°F, cSt		–	10.0	–	10.0

1. Exception to T 59: Use 0.02 N CaCl₂ solution in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.

2.7. **Crumb Rubber Modifier.** Crumb rubber modifier (CRM) consists of automobile and truck tires processed by ambient temperature grinding.

CRM must be:

- free from contaminants including fabric, metal, and mineral and other nonrubber substances;
- free-flowing; and
- nonfoaming when added to hot asphalt binder.

Ensure rubber gradation meets the requirements of the grades in Table 13 when tested in accordance with [Tex-200-F](#), Part I, using a 50-g sample.

Table 13
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	–	–	–	–	–	As shown on the plans	As approved
#10	95	100	100	–	–	–		
#16	–	–	70	100	100	–		
#30	–	–	25	60	90	100		
#40	–	–	–	–	45	100		
#50	0	10	–	–	–	–		
#200	–	–	0	5	–	–		

2.8. **Crack Sealer.** Provide polymer-modified asphalt-emulsion crack sealer meeting the requirements of Table 14. Provide rubber-asphalt crack sealer meeting the requirements of Table 15.

Table 14
Polymer-Modified Asphalt-Emulsion Crack Sealer

Property	Test Procedure	Min	Max
Rotational viscosity, 77°F, cP	D 2196, Method A	10,000	25,000
Sieve test, %	T 59	–	0.1
Storage stability, 1 day, %	T 59	–	1
Evaporation Residue by evaporation, % by wt.	Tex-543-C	65	–
Tests on residue from evaporation:			
Penetration, 77°F, 100 g, 5 sec.	T 49	35	75
Softening point, °F	T 53	140	–
Ductility, 39.2°F, 5 cm/min., cm	T 51	100	–

Table 15
Rubber-Asphalt Crack Sealer

Property	Test Procedure	Class A		Class B	
		Min	Max	Min	Max
CRM content, Grade A or B, % by wt.	Tex-544-C	22	26	–	–
CRM content, Grade B, % by wt.	Tex-544-C	–	–	13	17
Virgin rubber content, ¹ % by wt.		–	–	2	–
Flash point, ² C.O.C., °F	T 48	400	–	400	–
Penetration, ³ 77°F, 150 g, 5 sec.	T 49	30	50	30	50
Penetration, ³ 32°F, 200 g, 60 sec.	T 49	12	–	12	–
Softening point, °F	T 53	–	–	170	–
Bond Test, non-immersed, 0.5 in specimen, 50% extension, 20°F ⁴	D5329	–		Pass	

1. Provide certification that the Min % virgin rubber was added.
2. Agitate the sealing compound with a 3/8- to 1/2-in. (9.5- to 12.7-mm) wide, square-end metal spatula to bring the material on the bottom of the cup to the surface (i.e., turn the material over) before passing the test flame over the cup. Start at one side of the thermometer, move around to the other, and then return to the starting point using 8 to 10 rapid circular strokes. Accomplish agitation in 3 to 4 sec. Pass the test flame over the cup immediately after stirring is completed.
3. Exception to T 49: Substitute the cone specified in D 217 for the penetration needle.
4. Allow no crack in the crack sealing materials or break in the bond between the sealer and the mortar blocks over 1/4 in. deep for any specimen after completion of the test.

- 2.9. **Asphalt-Rubber Binders.** Provide asphalt-rubber (A-R) binders that are mixtures of asphalt binder and CRM, which have been reacted at elevated temperatures. Provide A-R binders meeting D6114 and containing a minimum of 15% CRM by weight. Provide Types I or II, containing CRM Grade C, for use in hot-mixed aggregate mixtures. Provide Types II or III, containing CRM Grade B, for use in surface treatment binder. Ensure binder properties meet the requirements of Table 16.

Table 16
A-R Binders

Property	Test Procedure	Binder Type					
		Type I		Type II		Type III	
		Min	Max	Min	Max	Min	Max
Apparent viscosity, 347°F, cP	D2196, Method A	1,500	5,000	1,500	5,000	1,500	5,000
Penetration, 77°F, 100 g, 5 sec.	T 49	25	75	25	75	50	100
Penetration, 39.2°F, 200 g, 60 sec.	T 49	10	–	15	–	25	–
Softening point, °F	T 53	135	–	130	–	125	–
Resilience, 77°F, %	D5329	25	–	20	–	10	–
Flash point, C.O.C., °F	T 48	450	–	450	–	450	–
Tests on residue from Thin-Film Oven Test:	T 179						
Retained penetration ratio, 39.2°F, 200 g, 60 sec., % of original	T 49	75	–	75	–	75	–

- 2.10. **Performance-Graded Binders.** Provide PG binders that are smooth and homogeneous, show no separation when tested in accordance with [Tex-540-C](#), and meet the requirements of Table 17.

Separation testing is not required if:

- a modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer,
- the binder is blended on site in continuously agitated tanks, or
- binder acceptance is based on field samples taken from an in-line sampling port at the hot-mix plant after the addition of modifiers.

Table 17
Performance-Graded Binders

Property and Test Method	Performance-Graded Binders																	
	PG 58			PG 64			PG 70			PG 76			PG 82					
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C ¹	< 58			< 64			< 70			< 76			< 82					
Min pavement design temperature, °C ¹	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
Original Binder																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316: ^{2,3} Max, 3.0 Pa-s, test temperature, °C	135																	
Dynamic shear, T 315: ⁴ G*/sin(δ), Min, 1.00 kPa, Max, 2.00 kPa, ⁷ Test temperature @ 10 rad/sec., °C	58			64			70			76			82					
Elastic recovery, D 6084, 50°F, % Min	-	-	30	-	-	30	50	-	30	50	60	30	50	60	70	50	60	70
Rolling Thin-Film Oven (Tex-541-C)																		
Mass loss, Tex-541-C, Max, %	1.0																	
Dynamic shear, T 315: G*/sin(δ), Min, 2.20 kPa, Max, 5.00 kPa, ⁷ Test temperature @ 10 rad/sec., °C	58			64			70			76			82					
Pressure Aging Vessel (PAV) Residue (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315: G* sin(δ), Max, 5,000 kPa Test temperature @ 10 rad/sec., °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22
Creep stiffness, T 313: ^{5,6} S, max, 300 MPa, m-value, Min, 0.300 Test temperature @ 60 sec., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct tension, T 314: ⁶ Failure strain, Min, 1.0% Test temperature @ 1.0 mm/min., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

- Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or by following the procedures outlined in AASHTO MP 2 and PP 28.
- This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).
- Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.
- For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of G*/sin(δ) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).
- Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.
- If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.
- Maximum values for unaged and RTFO aged dynamic shear apply only to materials used as substitute binders, as described in specification Items 340, "Dense-Graded Hot-Mix Asphalt (Small Quantity)," 341, "Dense-Graded Hot-Mix Asphalt," and 344, "Superpave Mixtures."

3. EQUIPMENT

Provide all equipment necessary to transport, store, sample, heat, apply, and incorporate asphalts, oils, and emulsions.

4. CONSTRUCTION

Typical Material Use. Use materials shown in Table 18, unless otherwise determined by the Engineer.

Table 18
Typical Material Use

Material Application	Typically Used Materials
Hot-mixed, hot-laid asphalt mixtures	PG binders, A-R binders Types I and II
Surface treatment	AC-5, AC-10, AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20XP, AC-10-2TR, AC-20-5TR, HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, CHFRS-2P, A-R binders Types II and III
Surface treatment (cool weather)	RS-1P, CRS-1P, RC-250, RC-800, RC-3000, MC-250, MC-800, MC-3000, MC-2400L
Precoating	AC-5, AC-10, PG 64-22, SS-1, SS-1H, CSS-1, CSS-1H
Tack coat	PG Binders, SS-1H, CSS-1H, EAP&T
Fog seal	SS-1, SS-1H, CSS-1, CSS-1H
Hot-mixed, cold-laid asphalt mixtures	AC-0.6, AC-1.5, AC-3, AES-300, AES-300P, CMS-2, CMS-2S
Patching mix	MC-800, SCM I, SCM II, AES-300S
Recycling	AC-0.6, AC-1.5, AC-3, AES-150P, AES-300P, recycling agent, emulsified recycling agent
Crack sealing	SS-1P, polymer mod AE crack sealant, rubber asphalt crack sealers (Class A, Class B)
Microsurfacing	CSS-1P
Prime	MC-30, AE-P, EAP&T, PCE
Curing membrane	SS-1, SS-1H, CSS-1, CSS-1H, PCE
Erosion control	SS-1, SS-1H, CSS-1, CSS-1H, PCE

4.1.

Storage and Application Temperatures. Use storage and application temperatures in accordance with Table 19. Store and apply materials at the lowest temperature yielding satisfactory results. Follow the manufacturer's instructions for any agitation requirements in storage. Manufacturer's instructions regarding recommended application and storage temperatures supersede those of Table 19.

Table 19
Storage and Application Temperatures

Type-Grade	Application		Storage Maximum (°F)
	Recommended Range (°F)	Maximum Allowable (°F)	
AC-0.6, AC-1.5, AC-3	200–300	350	350
AC-5, AC-10	275–350	350	350
AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR	300–375	375	360
RC-250	125–180	200	200
RC-800	170–230	260	260
RC-3000	215–275	285	285
MC-30, AE-P	70–150	175	175
MC-250	125–210	240	240
MC-800, SCM I, SCM II	175–260	275	275
MC-3000, MC-2400L	225–275	290	290
HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, CMS-2, CMS-2S, AES-300, AES-300S, AES-150P, AES-300P	120–160	180	180
SS-1, SS-1H, CSS-1, CSS-1H, PCE, EAP&T, SS-1P, RS-1P, CRS-1P, CSS-1P, recycling agent, emulsified recycling agent, polymer mod AE crack sealant	50–130	140	140
PG binders	275–350	350	350
Rubber asphalt crack sealers (Class A, Class B)	350–375	400	–
A-R binders Types I, II, and III	325–425	425	425

5. MEASUREMENT AND PAYMENT

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but is subsidiary or is included in payment for other pertinent items.

Item 310

Prime Coat



1. DESCRIPTION

Prepare and treat existing or newly constructed surface with an asphalt binder or other specialty prime coat binder material. Apply blotter material as required.

2. MATERIALS

- 2.1. **Binder.** Use material of the type and grade shown on the plans in accordance with Item 300, "Asphalts, Oils, and Emulsions," or as listed in the Department's MPL for prime coat binders.
- 2.2. **Blotter.** Use either base course sweepings obtained from cleaning the base or native sand as blotter materials unless otherwise shown on the plans or approved.

3. EQUIPMENT

Provide applicable equipment in accordance with Article 316.3., "Equipment."

4. CONSTRUCTION

- 4.1. **General.** Apply the mixture when the air temperature is at or above 60°F, or above 50°F and rising. Measure the air temperature in the shade away from artificial heat. The Engineer will determine when weather conditions are suitable for application.
- Do not permit traffic, hauling, or placement of subsequent courses over freshly constructed prime coats. Maintain the primed surface until placement of subsequent courses or acceptance of the work.
- 4.2. **Surface Preparation.** Prepare the surface by sweeping or other approved methods. Lightly sprinkle the surface with water before applying bituminous material, when directed, to control dust and ensure absorption.
- 4.3. **Application.**
- 4.3.1. **Binder.** The Engineer will select the application temperature within the limits recommended in Item 300, "Asphalts, Oils, and Emulsions," or by the material manufacturer. Apply material within 15°F of the selected temperature but do not exceed the maximum allowable temperature.
- Distribute the material smoothly and evenly at the rate selected by the Engineer. Roll the freshly applied prime coat with a pneumatic-tire roller to ensure penetration when directed.
- 4.3.2. **Blotter.** Spread blotter material before allowing traffic to use a primed surface. Apply blotter material to primed surface at the specified rate when "Prime Coat and Blotter" is shown on the plans as a bid item or as directed. Apply blotter to spot locations when "Prime Coat" is shown on the plans as a bid item or as directed to accommodate traffic movement through the work area. Remove blotter material before placing the surface. Dispose of blotter material according to applicable state and federal requirements.

5. MEASUREMENT

This Item will be measured by the gallon of binder placed and accepted.

6.**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 "Prime Coat" or "Prime Coat and Blotter" of the type and grade of binder specified. This price is full compensation for cleaning and sprinkling the area to be primed; materials, including blotter material; and rolling, equipment, labor, tools, and incidentals.

Item 360

Concrete Pavement



1. DESCRIPTION

Construct hydraulic cement concrete pavement with or without curbs on the concrete pavement.

2. MATERIALS

- 2.1. **Hydraulic Cement Concrete.** Provide hydraulic cement concrete in accordance with Item 421, "Hydraulic Cement Concrete." Use compressive strength testing unless otherwise shown on the plans. Provide Class P concrete designed to meet a minimum average compressive strength of 3,200 psi or a minimum average flexural strength of 450 psi at 7 days or a minimum average compressive strength of 4,000 psi or a minimum average flexural strength of 570 psi at 28 days. Test in accordance with [Tex-448-A](#) or [Tex-418-A](#).
- Obtain written approval if the concrete mix design exceeds 520 lb. per cubic yard of cementitious material.
- Use coarse aggregates for continuously reinforced concrete pavements to produce concrete with a coefficient of thermal expansion not more than 5.5×10^{-6} in./in./°F. Provide satisfactory [Tex-428-A](#) test data from an approved testing laboratory if the coarse aggregate coefficient of thermal expansion listed on the Department's *Concrete Rated Source Quality Catalog* is not equal to or less than 5.5×10^{-6} in./in./°F.
- Provide Class HES concrete for very early opening of small pavement areas or leave-outs to traffic when shown on the plans or allowed. Design Class HES to meet the requirements of Class P and a minimum average compressive strength of 3,200 psi or a minimum average flexural strength of 450 psi in 24 hr., unless other early strength and time requirements are shown on the plans or allowed.
- Use Class A or P concrete meeting the requirements of Item 421, "Hydraulic Cement Concrete," and this Item for curbs that are placed separately from the pavement.
- 2.2. **Reinforcing Steel.** Provide Grade 60 or above, deformed steel for bar reinforcement in accordance with Item 440, "Reinforcement for Concrete." Provide positioning and supporting devices (baskets and chairs) capable of securing and holding the reinforcing steel in proper position before and during paving. Provide corrosion protection when shown on the plans.
- 2.2.1. **Dowels.** Provide smooth, straight dowels of the size shown on the plans, free of burrs, and conforming to the requirements of Item 440, "Reinforcement for Concrete." Coat dowels with a thin film of grease, wax, silicone or other approved de-bonding material. Provide dowel caps on the lubricated end of each dowel bar used in an expansion joint. Provide dowel caps filled with a soft compressible material with enough range of movement to allow complete closure of the expansion joint.
- 2.2.2. **Tie Bars.** Provide straight deformed steel tie bars. Provide either multiple-piece tie bars or single-piece tie bars as shown on the plans. Furnish multiple piece tie bar assemblies from the list of approved multiple-piece tie bars that have been prequalified in accordance with DMS-4515, "Multiple Piece Tie Bars for Concrete Pavements," when used. Multiple-piece tie bars used on individual projects must be sampled in accordance with [Tex-711-I](#), and tested in accordance with DMS-4515 "Multiple Piece Tie Bars for Concrete Pavements."
- 2.3. **Alternative Reinforcing Materials.** Provide reinforcement materials of the dimensions and with the physical properties specified when allowed or required by the plans. Provide manufacturer's certification of required material properties.

- 2.4. **Curing Materials.** Provide Type 2 membrane curing compound conforming to [DMS-4650](#), "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide SS-1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved. Provide materials for other methods of curing conforming to the requirements of Item 422, "Concrete Superstructures." Provide insulating blankets for curing fast track concrete pavement with a minimum thermal resistance (R) rating of 0.5 hour-square foot F/BTU. Use insulating blankets that are free from tears and are in good condition.
- 2.5. **Epoxy.** Provide Type III, Class C epoxy in accordance with [DMS-6100](#), "Epoxies and Adhesives," for installing all drilled-in reinforcing steel. Submit a work plan and request approval for the use of epoxy types other than Type III, Class C.
- 2.6. **Evaporation Retardant.** Provide evaporation retardant conforming to [DMS-4650](#), "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."
- 2.7. **Joint Sealants and Fillers.** Provide Class 5 or Class 8 joint-sealant materials and fillers unless otherwise shown on the plans or approved and other sealant materials of the size, shape, and type shown on the plans in accordance with [DMS-6310](#), "Joint Sealants and Fillers."

3. EQUIPMENT

Furnish and maintain all equipment in good working condition. Use measuring, mixing, and delivery equipment conforming to the requirements of Item 421, "Hydraulic Cement Concrete." Obtain approval for other equipment used.

- 3.1. **Placing, Consolidating, and Finishing Equipment.** Provide approved self-propelled paving equipment that uniformly distributes the concrete with minimal segregation and provides a smooth machine-finished consolidated concrete pavement conforming to plan line and grade. Provide an approved automatic grade control system on slip-forming equipment. Provide approved mechanically-operated finishing floats capable of producing a uniformly smooth pavement surface. Provide equipment capable of providing a fine, light water fog mist.

When string-less paving equipment is used, use Section 5.9.3, "Method C," and establish control points at maximum intervals of 500 ft. Use these control points as reference to perform the work.

Provide mechanically-operated vibratory equipment capable of adequately consolidating the concrete. Provide immersion vibrators on the paving equipment at sufficiently close intervals to provide uniform vibration and consolidation of the concrete over the entire width and depth of the pavement and in accordance with the manufacturer's recommendations. Provide immersion vibrator units that operate at a frequency in air of at least 8,000 cycles per minute. Provide enough hand-operated immersion vibrators for timely and proper consolidation of the concrete along forms, at all joints and in areas not covered by other vibratory equipment. Surface vibrators may be used to supplement equipment-mounted immersion vibrators. Provide tachometers to verify the proper operation of all vibrators.

For small or irregular areas or when approved, the paving equipment described in this Section is not required.

- 3.2. **Forming Equipment.**
- 3.2.1. **Pavement Forms.** Provide metal side forms of sufficient cross-section, strength, and rigidity to support the paving equipment and resist the impact and vibration of the operation without visible springing or settlement. Use forms that are free from detrimental kinks, bends, or warps that could affect ride quality or alignment. Provide flexible or curved metal or wood forms for curves of 100-ft. radius or less.
- 3.2.2. **Curb Forms.** Provide curb forms for separately placed curbs that are not slipformed that conform to the requirements of Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

- 3.3. **Reinforcing Steel Inserting Equipment.** Provide inserting equipment that accurately inserts and positions reinforcing steel in the plastic concrete parallel to the profile grade and horizontal alignment in accordance to plan details when approved.
- 3.4. **Texturing Equipment.**
- 3.4.1. **Carpet Drag.** Provide a carpet drag mounted on a work bridge or a manual moveable support system. Provide a single piece of carpet of sufficient transverse length to span the full width of the pavement being placed and adjustable so that a sufficient longitudinal length of carpet is in contact with the concrete being placed to produce the desired texture. Obtain approval to vary the length and width of the carpet to accommodate specific applications.
- 3.4.2. **Tining Equipment.** Provide a self-propelled metal tine device equipped with steel tines with cross-section approximately 1/32 in. thick × 1/12 in. wide. Provide tines for transverse tining equipment spaced at approximately 1 in., center-to-center, or provide tines for longitudinal tining equipment spaced at approximately 3/4 in., center-to-center. Manual methods that produce an equivalent texture may be used when it is impractical to use self-propelled equipment, such as for small areas, narrow width sections, and in emergencies due to equipment breakdown.
- 3.5. **Curing Equipment.** Provide a self-propelled machine for applying membrane curing compound using mechanically-pressurized spraying equipment with atomizing nozzles. Provide equipment and controls that maintain the required uniform rate of application over the entire paving area. Provide curing equipment that is independent of all other equipment when required to meet the requirements of Section 360.4.9., "Curing." Hand-operated pressurized spraying equipment with atomizing nozzles may only be used on small or irregular areas, narrow width sections, or in emergencies due to equipment breakdown.
- 3.6. **Sawing Equipment.** Provide power-driven concrete saws to saw the joints shown on the plans. Provide standby power-driven concrete saws during concrete sawing operations.
- 3.7. **Grinding Equipment.** Provide self-propelled powered grinding equipment that is specifically designed to smooth and texture concrete pavement using circular diamond blades when required. Provide equipment with automatic grade control capable of grinding at least a 3-ft. width longitudinally in each pass without damaging the concrete.
- 3.8. **Testing Equipment.** Provide testing equipment regardless of job-control testing responsibilities in accordance with Item 421, "Hydraulic Cement Concrete," unless otherwise shown on the plans or specified.
- 3.9. **Coring Equipment.** Provide coring equipment capable of extracting cores in accordance with the requirements of [Tex-424-A](#) when required.
- 3.10. **Miscellaneous Equipment.** Furnish both 10-ft. and 15-ft. steel or magnesium long-handled, standard straightedges. Furnish enough work bridges, long enough to span the pavement, for finishing and inspection operations.

4. CONSTRUCTION

Obtain approval for adjustments to plan grade-line to maintain thickness over minor subgrade or base high spots while maintaining clearances and drainage. Maintain subgrade or base in a smooth, clean, compacted condition in conformity with the required section and established grade until the pavement concrete is placed. Keep subgrade or base damp with water before placing pavement concrete.

Adequately light the active work areas for all nighttime operations. Provide and maintain tools and materials to perform testing.

- 4.1. **Paving and Quality Control Plan.** Submit a paving and quality control plan for approval before beginning pavement construction operations. Include details of all operations in the concrete paving process, including

methods to construct transverse joints, methods to consolidate concrete at joints, longitudinal construction joint layout, sequencing, curing, lighting, early opening, leave-outs, sawing, inspection, testing, construction methods, other details and description of all equipment. List certified personnel performing the testing. Submit revisions to the paving and quality control plan for approval.

- 4.2. **Job-Control Testing.** Perform all fresh and hardened concrete job-control testing at the specified frequency unless otherwise shown on the plans. Provide job-control testing personnel meeting the requirements of Item 421, "Hydraulic Cement Concrete." Provide and maintain testing equipment, including strength testing equipment at a location acceptable to the Engineer. Use of a commercial laboratory is acceptable. Maintain all testing equipment calibrated in accordance with pertinent test methods. Make strength-testing equipment available to the Engineer for verification testing.

Provide the Engineer the opportunity to witness all tests. The Engineer may require a retest if not given the opportunity to witness. Furnish a copy of all test results to the Engineer daily. Check the first few concrete loads for slump and temperature to verify concrete conformance and consistency on start-up production days. Sample and prepare strength-test specimens (2 specimens per test) on the first day of production and for each 3,000 sq. yd. or fraction thereof of concrete pavement thereafter. Prepare at least 1 set of strength-test specimens for each production day. Perform slump and temperature tests each time strength specimens are made. Monitor concrete temperature to ensure that concrete is consistently within the temperature requirements. The Engineer will direct random job-control sampling and testing. Immediately investigate and take corrective action as approved if any Contractor test result, including tests performed for verification purposes, does not meet specification requirements.

The Engineer will perform job-control testing when the testing by the Contractor is waived by the plans; however, this does not waive the Contractor's responsibility for providing materials and work in accordance with this Item.

- 4.2.1. **Job-Control Strength.** Use 7-day job-control concrete strength testing in accordance with [Tex-448-A](#) or [Tex-418-A](#) unless otherwise shown on the plans or permitted.

Use a compressive strength of 3,200 psi or a lower job-control strength value proven to meet a 28-day compressive strength of 4,000 psi as correlated in accordance with [Tex-427-A](#) for 7-day job-control by compressive strength. Use a flexural strength of 450 psi or a lower job-control strength value proven to meet a 28-day flexural strength of 570 psi as correlated in accordance with [Tex-427-A](#) for 7-day job-control by flexural strength.

Job control of concrete strength may be correlated to an age other than 7 days in accordance with [Tex-427-A](#) when approved. Job-control strength of Class HES concrete is based on the required strength and time.

Investigate the strength test procedures, the quality of materials, the concrete production operations, and other possible problem areas to determine the cause when a job-control concrete strength test value is more than 10% below the required job-control strength or when 3 consecutive job-control strength values fall below the required job-control strength. Take necessary action to correct the problem, including redesign of the concrete mix if needed. The Engineer may suspend concrete paving if the Contractor is unable to identify, document, and correct the cause of low-strength test values in a timely manner. The Engineer will evaluate the structural adequacy of the pavements if any job-control strength is more than 15% below the required job-control strength. Remove and replace pavements found to be structurally inadequate at no additional cost when directed.

- 4.2.2. **Split-Sample Verification Testing.** Perform split-sample verification testing with the Engineer on random samples taken and split by the Engineer at a rate of at least 1 for every 10 job-control samples. The Engineer will evaluate the results of split-sample verification testing. Immediately investigate and take corrective action as approved when results of split-sample verification testing differ more than the allowable differences shown in Table 1, or the average of 10 job-control strength results and the Engineer's split-sample strength result differ by more than 10%.

Table 1
Verification Testing Limits

Test Method	Allowable Differences
Temperature, Tex-422-A	2°F
Flexural strength, Tex-448-A	19%
Compressive strength, Tex-418-A	10%

- 4.3. **Reinforcing Steel and Joint Assemblies.** Accurately place and secure in position all reinforcing steel as shown on the plans. Place dowels at mid-depth of the pavement slab, parallel to the surface. Place dowels for transverse contraction joints parallel to the pavement edge. Tolerances for location and alignment of dowels will be shown on the plans. Stagger the lap locations so that no more than 1/3 of the longitudinal steel is spliced in any given 12-ft. width and 2-ft. length of the pavement. Use multiple-piece tie bars, drill and epoxy grout tie bars, or, if approved, mechanically-inserted single-piece tie bars at longitudinal construction joints. Verify that tie bars that are drilled and epoxied or mechanically inserted into concrete at longitudinal construction joints develop a pullout resistance equal to a minimum of 3/4 of the yield strength of the steel after 7 days. Test 15 bars using ASTM E488, except that alternate approved equipment may be used. All 15 tested bars must meet the required pullout strength. Perform corrective measures to provide equivalent pullout resistance if any of the test results do not meet the required minimum pullout strength. Repair damage from testing. Acceptable corrective measures include but are not limited to installation of additional or longer tie bars.
- 4.3.1. **Manual Placement.** Secure reinforcing bars at alternate intersections with wire ties or locking support chairs. Tie all splices with wire.
- 4.3.2. **Mechanical Placement.** Complete the work using manual placement methods described above if mechanical placement of reinforcement results in steel misalignment or improper location, poor concrete consolidation, or other inadequacies.
- 4.4. **Joints.** Install joints as shown on the plans. Joint sealants are not required on concrete pavement that is to be overlaid with asphaltic materials. Clean and seal joints in accordance with Item 438, "Cleaning and Sealing Joints." Repair excessive spalling of the joint saw groove using an approved method before installing the sealant. Seal all joints before opening the pavement to all traffic. Install a rigid transverse bulkhead, for the reinforcing steel, and shaped accurately to the cross-section of the pavement when placing of concrete is stopped.
- 4.4.1. **Placing Reinforcement at Joints.** Complete and place the assembly of parts at pavement joints at the required location and elevation, with all parts rigidly secured in the required position, when shown on the plans.
- 4.4.2. **Transverse Construction Joints.**
- 4.4.2.1. **Continuously Reinforced Concrete Pavement (CRCP).** Install additional longitudinal reinforcement through the bulkhead when shown on the plans. Protect the reinforcing steel immediately beyond the construction joint from damage, vibration, and impact.
- 4.4.2.2. **Concrete Pavement Contraction Design (CPCD).** Install and rigidly secure a complete joint assembly and bulkhead in the planned transverse contraction joint location when the placing of concrete is intentionally stopped. Install a transverse construction joint either at a planned transverse contraction joint location or mid-slab between planned transverse contraction joints when the placing of concrete is unintentionally stopped. Install tie bars of the size and spacing used in the longitudinal joints for mid-slab construction joints.
- 4.4.2.3. **Curb Joints.** Provide joints in the curb of the same type and location as the adjacent pavement. Use expansion joint material of the same thickness, type, and quality required for the pavement and of the section shown for the curb. Extend expansion joints through the curb. Construct curb joints at all transverse pavement joints. Place reinforcing steel into the plastic concrete pavement for non-monolithic curbs as shown on the plans unless otherwise approved. Form or saw the weakened plane joint across the full width

of concrete pavement and through the monolithic curbs. Construct curb joints in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

- 4.5. **Placing and Removing Forms.** Use clean and oiled forms. Secure forms on a base or firm subgrade that is accurately graded and that provides stable support without deflection and movement by form riding equipment. Pin every form at least at the middle and near each end. Tightly join and key form sections together to prevent relative displacement.

Set side forms far enough in advance of concrete placement to permit inspection. Check conformity of the grade, alignment, and stability of forms immediately before placing concrete, and make all necessary corrections. Use a straightedge or other approved method to test the top of forms to ensure that the ride quality requirements for the completed pavement will be met. Stop paving operations if forms settle or deflect more than 1/8 in. under finishing operations. Reset forms to line and grade, and refinish the concrete surface to correct grade.

Avoid damage to the edge of the pavement when removing forms. Repair damage resulting from form removal and honeycombed areas with a mortar mix within 24 hr. after form removal unless otherwise approved. Clean joint face and repair honeycombed or damaged areas within 24 hr. after a bulkhead for a transverse construction joint has been removed unless otherwise approved. Promptly apply membrane curing compound to the edge of the concrete pavement when forms are removed before 72 hr. after concrete placement.

Forms that are not the same depth as the pavement, but are within 2 in. of that depth are permitted if the subbase is trenched or the full width and length of the form base is supported with a firm material to produce the required pavement thickness. Promptly repair the form trench after use. Use flexible or curved wood or metal forms for curves of 100-ft. radius or less.

- 4.6. **Concrete Delivery.** Clean delivery equipment as necessary to prevent accumulation of old concrete before loading fresh concrete. Use agitated delivery equipment for concrete designed to have a slump of more than 5 in. Segregated concrete is subject to rejection.

Begin the discharge of concrete delivered in agitated delivery equipment conforming to the requirements of Item 421, "Hydraulic Cement Concrete." Place non-agitated concrete within 45 min. after batching. Reduce times as directed when hot weather or other conditions cause quick setting of the concrete.

- 4.7. **Concrete Placement.** Do not allow the pavement edge to deviate from the established paving line by more than 1/2 in. at any point. Place the concrete as near as possible to its final location, and minimize segregation and rehandling. Distribute concrete using shovels where hand spreading is necessary. Do not use rakes or vibrators to distribute concrete.

- 4.7.1. **Consolidation.** Consolidate all concrete by approved mechanical vibrators operated on the front of the paving equipment. Use immersion-type vibrators that simultaneously consolidate the full width of the placement when machine finishing. Keep vibrators from dislodging reinforcement. Use hand-operated vibrators to consolidate concrete along forms, at all joints and in areas not accessible to the machine-mounted vibrators. Do not operate machine-mounted vibrators while the paving equipment is stationary. Vibrator operations are subject to review.

- 4.7.2. **Curbs.** Conform to the requirements of Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter" where curbs are placed separately.

- 4.7.3. **Temperature Restrictions.** Place concrete that is between 40°F and 95°F when measured in accordance with [Tex-422-A](#) at the time of discharge, except that concrete may be used if it was already in transit when the temperature was found to exceed the allowable maximum. Take immediate corrective action or cease concrete production when the concrete temperature exceeds 95°F.

Do not place concrete when the ambient temperature in the shade is below 40°F and falling unless approved. Concrete may be placed when the ambient temperature in the shade is above 35°F and rising or

above 40°F. Protect the pavement with an approved insulating material capable of protecting the concrete for the specified curing period when temperatures warrant protection against freezing. Submit for approval proposed measures to protect the concrete from anticipated freezing weather for the first 72 hr. after placement. Repair or replace all concrete damaged by freezing.

- 4.8. **Spreading and Finishing.** Finish all concrete pavement with approved self-propelled equipment. Use power-driven spreaders, power-driven vibrators, power-driven strike-off, screed, or approved alternate equipment. Use the transverse finishing equipment to compact and strike-off the concrete to the required section and grade without surface voids. Use float equipment for final finishing. Use concrete with a consistency that allows completion of all finishing operations without addition of water to the surface. Use the minimal amount of water fog mist necessary to maintain a moist surface. Reduce fogging if float or straightedge operations result in excess slurry.
- 4.8.1. **Finished Surface.** Perform sufficient checks with long-handled 10-ft. and 15-ft. straightedges on the plastic concrete to ensure the final surface is within the tolerances specified in Surface Test A in Item 585, "Ride Quality for Pavement Surfaces." Check with the straightedge parallel to the centerline.
- 4.8.2. **Maintenance of Surface Moisture.** Prevent surface drying of the pavement before application of the curing system by means that may include water fogging, the use of wind screens, and the use of evaporation retardants. Apply evaporation retardant at the manufacturer's recommended rate. Reapply the evaporation retardant as needed to maintain the concrete surface in a moist condition until curing system is applied. Do not use evaporation retardant as a finishing aid. Failure to take acceptable precautions to prevent surface drying of the pavement will be cause for shutdown of pavement operations.
- 4.8.3. **Surface Texturing.** Complete final texturing before the concrete has attained its initial set. Drag the carpet longitudinally along the pavement surface with the carpet contact surface area adjusted to provide a satisfactory coarsely textured surface. Prevent the carpet from getting plugged with grout. Do not perform carpet dragging operations while there is excessive bleed water.

A metal-tine texture finish is required unless otherwise shown on the plans. Provide transverse tining unless otherwise shown on the plans. Immediately following the carpet drag, apply a single coat of evaporation retardant, if needed, at the rate recommended by the manufacturer. Provide the metal-tine finish immediately after the concrete surface has set enough for consistent tining. Operate the metal-tine device to obtain grooves approximately 3/16 in. deep, with a minimum depth of 1/8 in., and approximately 1/12 in. wide. Do not overlap a previously tined area. Use manual methods to achieve similar results on ramps, small or irregular areas, and narrow width sections of pavements. Repair damage to the edge of the slab and joints immediately after texturing. Do not tine pavement that will be overlaid or that is scheduled for blanket diamond grinding or shot blasting.

Target a carpet drag texture of 0.04 in., as measured by [Tex-436-A](#), when carpet drag is the only surface texture required on the plans. Ensure adequate and consistent macro-texture is achieved by applying enough weight to the carpet and by keeping the carpet from getting plugged with grout. Correct any location with a texture less than 0.03 in. by diamond grinding or shot blasting. The Engineer will determine the test locations at points located transversely to the direction of traffic in the outside wheel path.

- 4.8.4. **Small, Irregular Area, or Narrow Width Placements.** Use hand equipment and procedures that produce a consolidated and finished pavement section to the line and grade where machine placements and finishing of concrete pavement are not practical.
- 4.8.5. **Emergency Procedures.** Use hand-operated equipment for applying texture, evaporation retardant, and cure in the event of equipment breakdown.
- 4.9. **Curing.** Keep the concrete pavement surface from drying as described in Section 360.4.8.2., "Maintenance of Surface Moisture," until the curing material has been applied. Maintain and promptly repair damage to curing materials on exposed surfaces of concrete pavement continuously for at least 3 curing days. A curing day is defined as a 24-hr. period when either the temperature taken in the shade away from artificial heat is above 50°F for at least 19 hr. or the surface temperature of the concrete is maintained above 40°F for 24 hr.

Curing begins when the concrete curing system has been applied. Stop concrete paving if curing compound is not being applied promptly and maintained adequately. Other methods of curing in accordance with Item 422, "Concrete Superstructures," may be used when specified or approved.

- 4.9.1. **Membrane Curing.** Spray the concrete surface uniformly with 2 coats of membrane curing compound at an individual application rate of no more than 180 sq. ft. per gallon. Apply the curing compound before allowing the concrete surface to dry.

Manage finishing and texturing operations to ensure placement of curing compound on a moist concrete surface, relatively free of bleed water, to prevent any plastic shrinkage cracking. Time the application of curing compound to prevent plastic shrinkage cracking.

Maintain curing compounds in a uniformly agitated condition, free of settlement before and during application. Do not thin or dilute the curing compound.

Apply additional compound at the same rate of coverage to correct damage where the coating shows discontinuities or other defects or if rain falls on the newly coated surface before the film has dried enough to resist damage. Ensure that the curing compound coats the sides of the tining grooves.

- 4.9.2. **Asphalt Curing.** Apply a uniform coating of asphalt curing at a rate of 90 to 180 sq. ft. per gallon when an asphaltic concrete overlay is required. Apply curing immediately after texturing and once the free moisture (sheen) has disappeared. Obtain approval to add water to the emulsion to improve spray distribution. Maintain the asphalt application rate when using diluted emulsions. Maintain the emulsion in a mixed condition during application.

- 4.9.3. **Curing Class HES Concrete.** Provide membrane curing in accordance with Section 360.4.9.1., "Membrane Curing," for all Class HES concrete pavement. Promptly follow by wet mat curing in accordance with Section 422.4.8., "Final Curing," until opening strength is achieved but not less than 24 hr.

- 4.9.4. **Curing Fast-Track Concrete Pavement.** Provide wet mat curing unless otherwise shown on the plans or as directed. Cure in accordance with Section 422.4.8., "Final Curing." Apply a Type 1-D or Type 2 membrane cure instead of wet mat curing if the air temperature is below 65°F and insulating blankets are used.

- 4.10. **Sawing Joints.** Saw joints to the depth shown on the plans as soon as sawing can be accomplished without damage to the pavement regardless of time of day or weather conditions. Some minor raveling of the saw-cut is acceptable. Use a chalk line, string line, sawing template, or other approved method to provide a true joint alignment. Provide enough saws to match the paving production rate to ensure sawing completion at the earliest possible time to avoid uncontrolled cracking. Reduce paving production if necessary to ensure timely sawing of joints. Promptly restore membrane cure damaged within the first 72 hr. of curing.

- 4.11. **Protection of Pavement and Opening to Traffic.** Testing for early opening is the responsibility of the Contractor regardless of job-control testing responsibilities unless otherwise shown on the plans or as directed. Testing result interpretation for opening to traffic is subject to approval.

- 4.11.1. **Protection of Pavement.** Erect and maintain barricades and other standard and approved devices that will exclude all vehicles and equipment from the newly placed pavement for the periods specified. Protect the pavement from damage due to crossings using approved methods before opening to traffic. Where a detour is not readily available or economically feasible, an occasional crossing of the roadway with overweight equipment may be permitted for relocating equipment only but not for hauling material. When an occasional crossing of overweight equipment is permitted, temporary matting or other approved methods may be required.

Maintain an adequate supply of sheeting or other material to cover and protect fresh concrete surface from weather damage. Apply as needed to protect the pavement surface from weather.

- 4.11.2. **Opening Pavement to All Traffic.** Pavement that is 7 days old may be opened to all traffic. Clean pavement, place stable material against the pavement edges, seal joints, and perform all other traffic safety related work before opening to traffic.
- 4.11.3. **Opening Pavement to Construction Equipment.** Unless otherwise shown on the plans, concrete pavement may be opened early to concrete paving equipment and related delivery equipment after the concrete is at least 48 hr. old and opening strength has been demonstrated in accordance with Section 360.4.11.4., “Early Opening to All Traffic,” before curing is complete. Keep delivery equipment at least 2 ft. from the edge of the concrete pavement. Keep tracks of the paving equipment at least 1 ft. from the pavement edge. Protect textured surfaces from the paving equipment. Restore damaged membrane curing as soon as possible. Repair pavement damaged by paving or delivery equipment before opening to all traffic.
- 4.11.4. **Early Opening to All Traffic.** Concrete pavement may be opened after curing is complete and the concrete has attained a flexural strength of 450 psi or a compressive strength of 3,200 psi, except that pavement using Class HES concrete may be opened after 24 hr. if the specified strength is achieved.
- 4.11.4.1. **Strength Testing.** Test concrete specimens cured under the same conditions as the portion of the pavement involved.
- 4.11.4.2. **Maturity Method.** Use the maturity method, [Tex-426-A](#), to estimate concrete strength for early opening pavement to traffic unless otherwise shown on the plans. Install at least 2 maturity sensors for each day’s placement in areas where the maturity method will be used for early opening. Maturity sensors, when used, will be installed near the day’s final placement for areas being evaluated for early opening. Use test specimens to verify the strength–maturity relationship in accordance with [Tex-426-A](#), starting with the first day’s placement corresponding to the early opening pavement section.
- Verify the strength–maturity relationship at least every 10 days of production after the first day. Establish a new strength–maturity relationship when the strength specimens deviate more than 10% from the maturity-estimated strengths. Suspend use of the maturity method for opening pavements to traffic when the strength–maturity relationship deviates by more than 10% until a new strength–maturity relationship is established.
- The Engineer will determine the frequency of verification when the maturity method is used intermittently or for only specific areas.
- 4.11.5. **Fast Track Concrete Pavement.** Open the pavement after the concrete has been cured for at least 8 hr. and attained a minimum compressive strength of 1,800 psi or a minimum flexural strength of 255 psi when tested in accordance with Section 360.4.11.4.1., “Strength Testing,” or Section 360.4.11.4.2., “Maturity Method,” unless otherwise directed. Cover the pavement with insulating blankets when the air temperature is below 65°F until the pavement is opened to traffic.
- 4.11.6. **Emergency Opening to Traffic.** Open the pavement to traffic under emergency conditions, when the pavement is at least 72 hr. old when directed in writing. Remove all obstructing materials, place stable material against the pavement edges, and perform other work involved in providing for the safety of traffic as required for emergency opening.
- 4.12. **Pavement Thickness.** The Engineer will check the thickness in accordance with [Tex-423-A](#) unless other methods are shown on the plans. The Engineer will perform 1 thickness test consisting of 1 reading at approximately the center of the paving equipment every 500 ft. or fraction thereof. Core where directed, in accordance with [Tex-424-A](#), to verify deficiencies of more than 0.2 in. from plan thickness and to determine the limits of deficiencies of more than 0.75 in. from plan thickness. Fill core holes using an approved concrete mixture and method.
- 4.12.1. **Thickness Deficiencies Greater than 0.2 in.** Take one 4-in. diameter core at that location to verify the measurement when any depth test measured in accordance with [Tex-423-A](#) is deficient by more than 0.2 in. from the plan thickness.

Take 2 additional cores from the unit (as defined in Section 360.4.12.3., "Pavement Units for Payment Adjustment" at intervals of at least 150 ft. and at selected locations if the core is deficient by more than 0.2 in., but not by more than 0.75 in. from the plan thickness, and determine the thickness of the unit for payment purposes by averaging the length of the 3 cores. In calculations of the average thickness of this unit of pavement, measurements in excess of the specified thickness by more than 0.2 in. will be considered as the specified thickness plus 0.2 in.

- 4.12.2. **Thickness Deficiencies Greater than 0.75 in.** Take additional cores at 10-ft. intervals in each direction parallel to the centerline to determine the boundary of the deficient area if a core is deficient by more than 0.75 in. The Engineer will evaluate any area of pavement found deficient in thickness by more than 0.75 in., but not more than 1 in. Remove and replace the deficient areas without additional compensation or retain deficient areas without compensation, as directed. Remove and replace any area of pavement found deficient in thickness by more than 1 in. without additional compensation.
- 4.12.3. **Pavement Units for Payment Adjustment.** Limits for applying a payment adjustment for deficient pavement thickness from 0.20 in. to not more than 0.75 in. are 500 ft. of pavement in each lane. Lane width will be as shown on typical sections and pavement design standards.
- For greater than 0.75 in. deficient thickness, the limits for applying zero payment or requiring removal will be defined by coring or equivalent nondestructive means as determined by the Engineer. The remaining portion of the unit determined to be less than 0.75 in. deficient will be subject to the payment adjustment based on the average core thickness at each end of the 10-ft. interval investigation as determined by the Engineer.
- Shoulders will be measured for thickness unless otherwise shown on the plans. Shoulders 6 ft. wide or wider will be considered as lanes. Shoulders less than 6 ft. wide will be considered part of the adjacent lane.
- Limits for applying payment adjustment for deficient pavement thickness for ramps, widenings, acceleration and deceleration lanes, and other miscellaneous areas are 500 ft. in length. Areas less than 500 ft. in length will be individually evaluated for payment adjustment based on the plan area.
- 4.13. **Ride Quality.** Measure ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

5. MEASUREMENT

This Item will be measured as follows:

- 5.1. **Concrete Pavement.** Concrete pavement will be measured by the square yard of surface area in place. The surface area includes the portion of the pavement slab extending beneath the curb.
- 5.2. **Curb.** Curb on concrete pavement will be measured by the foot in place.

6. PAYMENT

These prices are full compensation for materials, equipment, labor, tools, and incidentals.

- 6.1. **Concrete Pavement.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the adjusted unit price bid for "Concrete Pavement" of the type and depth specified as adjusted in accordance with Section 360.6.2., "Deficient Thickness Adjustment."
- 6.2. **Deficient Thickness Adjustment.** Where the average thickness of pavement is deficient in thickness by more than 0.2 in. but not more than 0.75 in., payment will be made using the adjustment factor as specified in Table 2 applied to the bid price for the deficient area for each unit as defined under Section 360.4.12.3., "Pavement Units for Payment Adjustment."

Table 2
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	Proportional Part of Contract Price Allowed (Adjustment Factor)
Not deficient	1.00
Over 0.00 through 0.20	1.00
Over 0.20 through 0.30	0.80
Over 0.30 through 0.40	0.72
Over 0.40 through 0.50	0.68
Over 0.50 through 0.75	0.57

- 6.3. **Curb.** Work performed and furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Curb" of the type specified.

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 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.