

**CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS**



BID SET

**CONTRACT DOCUMENTS AND SPECIFICATIONS
FOR THE CONSTRUCTION OF**

COH Project No. 22-10-14

COH Bid No. 23-25

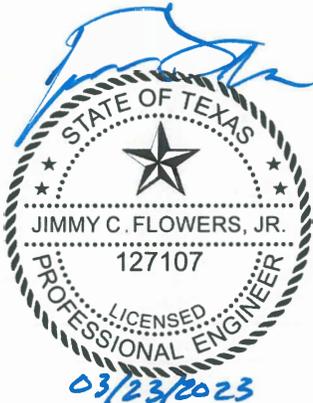
COH Project Name: 17TH Street Storm Sewer Improvements

LJA Project No: E243-0020

CITY OFFICIALS:

**Mayor:
Mayor Pro Tem:
Council Members:**

**Andy Brauninger
Russell Humphrey
Deloris Massey
Jon Strong
Bert Lyle
Karen Denman
Vicki McKenzie
Pat Graham**



**City Manager:
City Engineer:**

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

Prepared By:

Prepared For:

**LJA Engineering, Inc.
11821 East Freeway, Ste. 360
Houston, Texas 77320
Firm Registration No. F-1386**

**City of Huntsville
Engineering Department
448 Highway 75 North
Huntsville, Texas 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, 1220 11th Street, Huntsville, Texas 77340, until 3:00 p.m. Central Time, Thursday, April 6, 2023 for the purpose of furnishing all supervision, materials, equipment and the performing of all work required in the construction of the **17th Street Storm Sewer Improvements, Project No. 22-10-14, Bid No. 23-25** that includes:

1. Remove approximately 300 linear feet of existing 18-inch storm sewer and existing junction box.
2. Construct approximately 300 linear feet of proposed 24-inch storm sewer and proposed junction box.
3. Connect to the existing storm sewer system.
4. Paving and site restoration.

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. Estimated cost of the project is in the \$200,000 range.

BIDS shall be submitted in sealed envelopes upon the blank form furnished herewith. Sealed envelopes shall be marked: "**Bid for 17th Street Storm Sewer Improvements, Project No. 22-10-14, Bid No. 23-25**". Do not open until 3:00 p.m. Central Time, Thursday, April 6, 2023.

PRE-BID CONFERENCE – A pre-bid conference (non-mandatory) will be held at 10:00 a.m., Wednesday, March 29, 2023 at the City of Huntsville Service Center, Public Works Conference Room (2nd Floor) at 448 State Hwy.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 Hwy. 75 North, Huntsville, Texas
Tel: (936) 294-5794

LJA Engineering, 11821 East Freeway, Ste. 360, Houston, Texas
Tel: (713) 450-1300

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 Sixty (60) calendar days from the date given in the "NOTICE TO PROCEED".

March 23, 2023

Date

Kristy Doll

Kristy Doll, City Secretary

Legal Ad Dates: Saturday, March 25, 2023
Saturday, April 1, 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 17TH Street Storm Sewer Improvements, Project # 22-10-14, Bid No. 23-25. 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, 1220 11TH Street, 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. 23-25 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 **Thursday, March 30, 2023 @ 4:00 P.M.** as addressed above. All questions or requests for interpretation concerning the solicitation received after **Thursday, March 30, 2023 @ 4:00 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 **Monday, April 3, 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

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 The City of Huntsville 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.

Sample of Form 1295

CERTIFICATE OF INTERESTED PARTIES		FORM 1295																	
Complete Nos. 1 - 4 and 6 if there are interested parties. Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.		OFFICE USE ONLY																	
1 Name of business entity filing form, and the city, state and country of the business entity's place of business.		Must file online at www.ethics.state.tx.us/File																	
2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.																			
3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.																			
4	Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)																
			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">Controlling</td> <td style="width: 50%; padding: 2px;">Intermediary</td> </tr> <tr><td style="height: 15px;"> </td><td> </td></tr> </table>	Controlling	Intermediary														
Controlling	Intermediary																		
5 Check only if there is NO Interested Party. <input type="checkbox"/>																			
6 UNSWORN DECLARATION My name is _____, and my date of birth is _____. My address is _____, _____, _____, _____, _____. (street) (city) (state) (zip code) (country) I declare under penalty of perjury that the foregoing is true and correct. Executed in _____ County, State of _____, on the _____ day of _____, 20_____. (month) (year) <div style="text-align: right; margin-top: 10px;"> _____ Signature of authorized agent of contracting business entity (Declarant) </div>																			
ADD ADDITIONAL PAGES AS NECESSARY																			

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 Iron, 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 The City of Huntsville, Texas 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 of 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 the City of Huntsville 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: 17TH Street Storm Sewer Improvements Project #22-10-14

Bid Number: 23-25

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 **Thursday, March 30, 2023 by 4:00 p.m.** 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 **Thursday, March 30, 2023 by 4:00 p.m.** 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: **17th Street Storm Sewer Improvements**
Project No. 22-10-14, Bid No. 23-25

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 **Sixty (60)** 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.: 22-10-14 & Bid No.: 23-25

Project Name: 17TH STREET STORM SEWER IMPROVEMENTS

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
1	Remove Existing Reinforced Concrete Sidewalk, Maximum Extents As Shown on Plans, to Nearest Expansion Joint, Including 2-Inch Depth Saw-Cut if Necessary COMPLETE IN PLACE	110	SY			and _____/100ths Dollars.
2	Remove Existing Reinforced Concrete Curb and Gutter, Maximum Extents As Shown on Plans, to Nearest Expansion Joint, Including 2-Inch Depth Saw-Cut if Necessary COMPLETE IN PLACE	320	SY			and _____/100ths Dollars.
3	Remove Existing Asphalt Pavement and Base As Necessary for Construction, Maximum Extents As Shown on Plans, Including 2-Inch Depth Saw-Cut COMPLETE IN PLACE	135	SY			and _____/100ths Dollars.
4	Remove Existing Asphalt Driveway and Base, Maximum Extents As Shown on Plans, Including 2-Inch Depth Saw-Cut COMPLETE IN PLACE	75	SY			and _____/100ths Dollars.
5	Remove Existing Storm Sewer, 24-Inch or Less COMPLETE IN PLACE	291	LF			and _____/100ths Dollars.
6	Remove Existing Storm Sewer Junction Box COMPLETE IN PLACE	1	EA			and _____/100ths Dollars.
7	24-Inch Reinforced Concrete Pipe Storm Sewer, ASTM C-76, Class III COMPLETE IN PLACE	291	LF			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 22-10-14 & Bid No.: 23-25

Project Name: 17TH STREET STORM SEWER IMPROVEMENTS

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
8	Reinforced Concrete Junction Box with Manhole Access Cover, Including Connections of Proposed and Existing Storm Sewers, Per Details on Plans COMPLETE IN PLACE	1	EA			and _____/100ths Dollars.
9	Connection of Proposed 24-Inch Reinforced Concrete Pipe Storm Sewer to Existing Reinforced Box Culvert, Per Details on Plans COMPLETE IN PLACE	1	EA			and _____/100ths Dollars.
10	Trench Safety System COMPLETE IN PLACE	300	LF			and _____/100ths Dollars.
11	Reinforced Concrete Sidewalk, 4 1/2-Inch Thick, and Base, Per Details on Plans COMPLETE IN PLACE	110	SY			and _____/100ths Dollars.
12	Reinforced Concrete Curb and Gutter, Per Details on Plans COMPLETE IN PLACE	160	LF			and _____/100ths Dollars.
13	Reinforced Concrete Gutter, Per Details on Plans COMPLETE IN PLACE	160	LF			and _____/100ths Dollars.
14	Asphalt Surface Restoration, Including 8-Inch Thick Asphalt Base, Gr. 2, PG-64, Per TXDOT Item 292, and 2 1/2-Inch Thick HMHL Surface Coarse, Type "D" per TXDOT Item 340 COMPLETE IN PLACE	210	SY			and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 22-10-14 & Bid No.: 23-25

Project Name: 17TH STREET STORM SEWER IMPROVEMENTS

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
15	Traffic Control, as Necessary, Includes Acquiring Permits, Installation, Maintenance, & Removal of All Traffic Control Devices Required by Permit and as Shown on Project Plans COMPLETE IN PLACE	1	LS			and _____/100ths Dollars.
16	SWPPP, Installed, Maintained, and Removed, In Accordance with Best Management Practices COMPLETE IN PLACE	1	LS			and _____/100ths Dollars.

TOTAL BASE BID ITEMS (figures)

\$ _____

SUPPLEMENTARY BID ITEMS						
17	"Extra" Bank Sand, As Directed by Owner's Representative COMPLETE IN PLACE	100	CY	Min. Bid \$10 per Cubic Yard		and _____/100ths Dollars.
18	"Extra" Crushed Limestone Bedding, As Directed by Owner's Representative COMPLETE IN PLACE	50	CY	Min. Bid \$25 per Cubic Yard		and _____/100ths Dollars.
19	"Extra" Cement Stabilized Sand, 2.0 Sacks per Ton, As Directed by Owner's Representative COMPLETE IN PLACE	5	TON	Min. Bid \$30 per Ton		and _____/100ths Dollars.
20	"Extra" Class A Concrete, As Directed by Owner's Representative COMPLETE IN PLACE	25	CY	Min. Bid \$100 per Cubic Yard		and _____/100ths Dollars.
21	"Extra" Reinforcing Steel, As Directed by Owner's Representative COMPLETE IN PLACE	250	LB	Min. Bid \$1 per Pound		and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 22-10-14 & Bid No.: 23-25

Project Name: 17TH STREET STORM SEWER IMPROVEMENTS

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
22	"Extra" Turf Establishment, Full Sodding, As Directed by Owner's Representative COMPLETE IN PLACE	230	SY	Min. Bid \$2.50 per Square Yard		and _____/100ths Dollars.
23	6-Inch Waterline (PVC, AWWA C-909, DR-18) with Ductile Iron Fittings, Open Cut, Joint Restraints (as necessary), All Depths, As Directed by Owner's Representative COMPLETE IN PLACE	100	LF	Min. Bid \$60 per Linear Foot		and _____/100ths Dollars.
24	6-Inch Gate Valve (AWWA) with Adjustable Box, Joint Restraint (as necessary), Accessories, Concrete Collar COMPLETE IN PLACE	1	EA	Min. Bid \$1,500 per Each		and _____/100ths Dollars.
25	6-Inch Wet Connection, Including Valve Closures for Line Isolation and Cut & Plug Of Existing Line or Removal as Necessary, As Directed by Owner's Representative COMPLETE IN PLACE	1	EA	Min. Bid \$2,000 per Each		and _____/100ths Dollars.
26	Connection of Existing Water Service Line (2-Inch or Less) to New Waterline, Short Side, Including Tap, Pipe, and Valves, As Directed by Owner's Representative COMPLETE IN PLACE	1	EA	Min. Bid \$500 per Each		and _____/100ths Dollars.
27	Connection of Existing Water Service Line to New Waterline (4-Inch and Greater), Short Side, Including Tap, Pipe, and Valves, As Directed by Owner's Representative COMPLETE IN PLACE	1	EA	Min. Bid \$1,000 per Each		and _____/100ths Dollars.
28	6-Inch Insertion Valve (AWWA) with Adjustable Box, Joint Restraint (as necessary), Accessories, Concrete Collar, As Directed by Owner's Representative COMPLETE IN PLACE	1	EA	Min. Bid \$6,500 per Each		and _____/100ths Dollars.

Name of Company Submitting
Bid: _____



BID SHEET

Project No.: 22-10-14 & Bid No.: 23-25

Project Name: 17TH STREET STORM SEWER IMPROVEMENTS

Item No.	Description	Estimated Quantity	Unit of Measure	Bid Price		
				Unit Price	Total	Total in Written Words
29	Remove Existing Sanitary Sewer Service and Replace with (4-Inch or 6-Inch) Pressure Rated Pipe (PVC, AWWA C-900, DR-18) with Fernco Shielded Couplings, Fully Encased with Cement Stabilized Sand, Including Saw-Cut of Existing Pavement as Applicable, Cement Stabilized Sand Backfill, and Surface Restoration, As Directed by Owner's Representative COMPLETE IN PLACE	10	LF	Min. Bid \$60 per Linear Foot		and _____/100ths Dollars.
30	Reinforced Concrete Conflict Manhole with Access Cover, Including Connections of Proposed Storm Sewers, Remove Existing Sanitary Sewer Service and Replace with (4-Inch or 6-Inch) Pressure Rated Pipe (PVC, AWWA C-900, DR-18) with Fernco Shielded Couplings Stubbed Through Manhole, Fully Encased with Cement Stabilized Sand, Including Saw-Cut of Existing Pavement as Applicable, Cement Stabilized Sand Backfill, and Surface Restoration, As Directed by Owner's Representative COMPLETE IN PLACE	1	EA	Min. Bid \$7,500 per Each		and _____/100ths Dollars.

TOTAL SUPPLEMENTARY BID ITEMS (figures)

\$ _____

TOTAL PROJECT (figures)

\$ _____

**Total written
in words:**

and _____/100ths Dollars

OPEN AND READ ALOUD

By: _____

Dated: _____

Name of Company Submitting
Bid: _____

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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

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

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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>
---------------------------------------	----------------	-----------------------------------------------	------------------------------------------------

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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): City of Huntsville, Texas – 1212 Avenue M, Huntsville, Texas 77340

BID

Bid Due Date: Thursday, April 6, 2023 at 2:00 p.m.

Project (Brief Description Including Location): 17th Street Storm Sewer Improvements

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 Name: 17th Street Storm Sewer Improvements
Project No. 23-10-14
Bid No. 23-25

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 work to be complete within **Sixty (60)** 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.

The OWNER and CONTRACTOR acknowledge and agree that Time is of the Essence of this Agreement. With respect to Contract Times, the following terms control:

All of the Contract Times, individually and collectively, are of the essence of the Agreement. By executing this Agreement, the Contractor confirms that the Contract Times is reasonable period for performing the Work.

The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. Because time is of the essence, should Contractor fail to achieve Substantial Completion as required by the Contract Documents, the Owner will suffer financial and other losses if the Work is not completed within the Contract Times, as duly modified. The Parties also recognize the delays, expense, and difficulties involved in proving, in a legal proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that Contractor shall be liable to the Owner for liquidated damages for delay in the amount of One Thousand Dollars (\$1,000) per calendar day beyond the requisite Contract Time that Contractor fails to achieve Substantial Completion. The Contractor and Owner recognize and acknowledge that the Liquidated Damages are to compensate the Owner for Contractors delay and are not a penalty for late completion.

Performance and Payment Bonds are due within 10 days after the Agreement becomes effective. The date the last party signs the Agreement (as indicated by the date opposite or under the party's signature) will be deemed the effective date.

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

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PAYMENT BOND

Bond No. _____

THE STATE OF TEXAS
COUNTY OF _____

§
§
§

KNOW ALL BY THESE PRESENTS:

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: _____.

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: _____

Address: _____

(S E A L)

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**, Obligee 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 Obligee 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: _____.

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 Obligee from all costs and damages which Obligee may suffer by reason of Principal’s failure to perform the Work in conformity with the Contract Documents, and reimburse and repay Obligee for all outlay and expense that Obligee 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 Obligee to be in default under the Contract, the Surety shall, upon request of Obligee and within ten (10) calendar days from receipt of Obligee’s 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 Obligee. Surety further acknowledges and agrees that Surety shall obtain the Obligee’s 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: _____

PART V
GENERAL CONDITIONS (ASCE)

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids or Proposals which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor to request progress or final payments, accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed. Bid, as used herein, shall also refer to a Proposal provided in response to a request for proposals if the Owner has used a method of procurement other than a request for bids.
 5. *Bidder*—An individual or entity that submits a Bid to Owner. Bidder, as used herein, shall also refer to an Offeror who responds to a procurement solicitation other than a request for bids.
 6. *Books and Records* – All documents (whether paper, electronic, or other media) and electronically stored information, including, but not limited to, any and all books, correspondence, receipts, vouchers, estimates, records, contracts, cost data, schedules, subcontracts, schedules, job cost reports, and other data, including computations and projections, of Contractor related to bidding, negotiating, pricing, or performing the Preconstruction Services and/or Work.
 7. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 8. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both.

9. *Claim*

- a. A demand or assertion by Owner directly to Contractor seeking an adjustment of Contract Price or Contract Times or other relief as may be permitted by Contract or otherwise.
 - b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a item for which the Contract requires the Engineer's decision, or seeking resolution of a contractual issue that Engineer has declined or may not be required to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand or assertion by Owner of any right, contractual or otherwise, submitted to the Contractor for which an Engineer's initial decision would be required if of a technical nature or for other relief as provided by Contract or Laws and Regulations.
 - e. A demand for money or services by a third party is not a Claim.
10. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
11. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
12. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
13. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
14. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) achieve Final Complete of the Work.
15. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
16. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
17. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
18. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

19. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
21. *Final Completion* – The event set forth in Paragraph 15.06.D below.
22. *Final Payment* – Has the meaning set forth in Paragraph 15.06 below.
23. *Governmental Approval* – Any authorization, consent, approval, license, lease, ruling, permit, certification, exemption, or registration by or with any Governmental Unit.
24. *Governmental Unit* – Any national, state or local government, any political subdivision thereof, or any governmental, quasi-governmental, judicial, public or statutory instrumentality, administrative agency, authority, body or other person and/or entity having jurisdiction over the Site, performance of the Work, the Project or the Parties.
25. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
26. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
27. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
28. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
29. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid which shall be evidenced by formal award of the Contract following action by Owner.

30. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
31. *Owner*—The City of Huntsville, Texas.
32. *Progress Schedule or Project Schedule*—A schedule, prepared and maintained by Contractor, showing the critical path of the Work, describing the sequence and duration of the activities comprising Contractor’s plan to accomplish the Work within the Contract Times.
33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals.
36. *Schedule of Values*—A schedule allocating portions of the Contract Price to various portions of the Work and required to be submitted with each Application for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, which may also contain certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals. Submittals are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where the Work (or a specified part thereof) is sufficiently complete so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended.

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

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- C. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment, unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion and said damage has occurred between Substantial and Final Completion.
- D. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- E. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Bonds*: Contractor shall deliver to Owner such bonds as Contractor may be required to furnish within ten (10) days of the date on which Contractor signs the Agreement. Contractor shall not be permitted to commence performance of Work until the bonds have been delivered even though the Contract Times may have commenced..
- B. *Evidence of Contractor’s Insurance*: Before any Work at the Site may commence, Contractor shall deliver to the Owner certificates of insurance and policy endorsements pages for all insurance policies that may be required of Contractor by the Contract Documents evidencing

compliance with the Owner's insurance requirement as required in Article 5 and Exhibit A, Owner's Insurance Requirements, to these General Conditions.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor ___ printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, identifying the critical path for 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.

2.04 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence upon issuance of a Notice to Proceed by the Owner.

2.05 *Commencement of Performance*

- A. Contractor may commence performance upon receipt of the Notice to Proceed and in accordance with any terms and dates contained therein.

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 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Owner and Engineer.
1. The Progress Schedule will be acceptable to Owner if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Owner or 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 Owner if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Owner as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.08 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. Except as otherwise stated elsewhere in the Contract Documents, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or accessible digital format, either directly, or through access to a secure Project website..
- C. Contractor and all of Contractor's personnel shall maintain and save said electronic data in a format producible to Owner, if required for an audit as allowed by Paragraph 17.10 or otherwise. Said preservation requirement shall apply to all electronic transmittals allowed by this Paragraph 2.09, including all text and electronic mail messages..

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

3.02 *Reference Standards*

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

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, manufacturer's guidelines, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect as of the Effective Date of the Contract, except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof. Should Contractor perform the Work after discovery of such a conflict without reporting the conflict or before receipt of a clarification or interpretation by Engineer, Contractor will be solely liable for any correction or other measures that may be required to overcome the conflict or bring the Work into compliance with the Contract Documents.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Document, and judge of the acceptability of the Work. Owner shall have sole authority to accept the Work. Action of the Engineer shall not bind Owner to acceptance of the Work, or any part thereof, nor shall any act of the Engineer be relied upon by Contractor as an indicator of acceptance by the Owner.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, upon issuance of a Notice to Proceed by Owner.

4.02 *Commencement of Performance*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date. Contractor may commence performance upon receipt of the Notice to Proceed and in accordance with any terms and dates contained therein.

4.03 *Reference Points*

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

4.04 *Progress Schedule*

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

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times

- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. Abnormal weather conditions;
 3. Acts or failures to act of third-party utility owners or other third-party entities; and
 4. Acts of war or terrorism.
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the

activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations. Owner shall provide any easements for ingress or egress necessary for access to the Site.
- 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 for which the Site and any Owner provided easements do not provide.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such

owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings when used in this section refers to the following:*
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Bidding Documents or otherwise provide to the Contractor by Owner, but such Technical Data, reports and drawings are not Contract Documents. Contractor recognizes the and acknowledges the limitations identified in the reports and drawings. Contractor further acknowledges that the provision of reports and drawings is not a guarantee by the Owner that such conditions of sub-surface strata are infallible.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.
- E. Contractor accepts the responsibility to satisfy itself as to the soil conditions and nature and type of geological formations in and through which this Project will be constructed.
- F. Contractor waives any and all rights to make a claim against Owner relating to representations related to geotechnical data provided in the contract documents, plans and specifications. The locations of the test holes, if applicable, are shown in the Geotechnical Report. Logs of these test holes are included in the Geotechnical Report. Test holes information represents subsurface characteristics to the extent indicated and only for the point location of the test hole. Contractor shall make its own interpretation of the character and condition of the materials, which will be encountered. Contractor may, at its own expense, make additional surveys and investigations as it may deem necessary to determine conditions, which will affect performance of the Work.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about

- such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.
- B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract

Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

- c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within

the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing) in writing within twenty-four (24) hours of the discovery of such condition. Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs and deduct all costs incurred from the contract balance or if no contract balance, may file a claim for costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- J. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ENGINEER, AND THE OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS, AND SUBCONTRACTORS OF EACH AND ANY OF THEM, FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO THE FAILURE TO CONTROL, CONTAIN, OR REMOVE A CONSTITUENT OF CONCERN BROUGHT TO THE SITE BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE, OR TO A HAZARDOUS ENVIRONMENTAL CONDITION CREATED BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE. NOTHING IN THIS PARAGRAPH 5.06.J OBLIGATES CONTRACTOR TO INDEMNIFY ANY INDIVIDUAL OR ENTITY FROM AND AGAINST THE CONSEQUENCES OF THAT INDIVIDUAL'S OR ENTITY'S OWN NEGLIGENCE.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds shall be in accordance with Texas Government Code chapters 2253 and 2269.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts. All bonds must comply with section 3503.005 of the Texas Insurance Code.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. Contractor's strict compliance with this section 6.01 is a material obligation of the Contract. If Contractor has failed to obtain a required bond or otherwise comply with this chapter, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Contractor shall obtain and maintain insurance as required in this article, in Exhibit A to these General Conditions, and in the Supplementary Conditions, if any.
- B. All insurance required by the Contract to be purchased and maintained by Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance, declarations, endorsements, and exclusions pages establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner, Contractor shall furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Failure of Owner to request such certificates or other evidence of the Contractor’s full compliance with these insurance requirements, or failure of Owner to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the Contractor’s obligation to obtain and maintain such insurance which is a material obligation of the Contract.
- F. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner’s option, may purchase and maintain Owner’s own liability insurance. Owner’s liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner’s liability policies for any of Contractor’s obligations to the Owner, Engineer, or third parties.
- G. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker’s compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities

identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- H. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- I. Without prejudice to any other right or remedy, if Contractor has failed to obtain required insurance, the Owner may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the Contractor's expense, and the Contract Price will be adjusted accordingly.
- J. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- K. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- L. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 1. include at least the specific coverages required;
 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed

by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);
 4. not seek contribution from insurance maintained by the additional insured; and
 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: If required on Exhibit A of these General Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- C. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

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

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

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other

insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and Owner shall have no responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written consent of Owner except under extraordinary circumstances. Such consent shall not be unreasonably withheld.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

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

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and

- 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination. Use of an unapproved "or-equal" item will render such Work defective and will be subject to Article 14 provisions.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

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

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination. Use of an unapproved "substitute" item will render such Work defective and will be subject to Article 14 provisions.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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

7.07 *Concerning Subcontractors and Suppliers*

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

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

7.08 *Patent Fees and Royalties*

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

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. The Owner enjoys tax-exempt status as a municipality. To enjoy the cost-savings benefits of its tax-exempt status, the Owner will provide a Tax Exemption Certificate to the Contractor for use on the Project. The Contractor shall use that certificate to exempt any purchases made for the Work from taxes. All savings for the tax-exempt status will be passed on to the Owner by the Contractor. The Contractor agrees to bind all Subcontractors of any tier to the obligation to present and use the Tax Exemption Certificate and pass all savings to the Owner.
- B. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

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

7.12 *Record Documents*

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

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Contractor shall comply with all Laws and Regulations concerning safety. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with

them in the protection, removal, relocation, and replacement of their property or work in progress.

- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

- 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
 3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
 4. After review and approval of Submittal, Shop Drawing or Sample by Engineer in accordance with this section, Contractor may rely on the information provided by Engineer. Work performed in accordance with an approved Submittal, Shop Drawing, or Sample and the Contract Documents will be presumed to be acceptable to Owner unless an actual defect in the Work is discovered.

C. Engineer's Review of Shop Drawings and Samples

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and

Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

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

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

- A. The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will strictly conform to the requirements of the Contract Documents and will be performed in a good and workmanlike manner, and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- E. Contractor's obligation to perform and complete the Work in strict accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or
 - 9. Any correction of defective Work by Owner.
- F. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.
- G. The Contractor warrants and guarantees for one (1) year from Final Completion, or for a longer period if expressly stated in the Contract Documents, the Work. This includes a Warranty and Guarantee against any and all defects. The Contractor must correct any and all defects in material and/or workmanship which may appear during the Warranty and Guarantee period, or any defects that occur within one (1) year of Final Completion even if discovered more than one (1) year after Final Completion, by repairing (or replacing with new items or new materials, if necessary) any such defect at no cost to the Owner, within a reasonable period of time, and to the Owner's satisfaction.

7.18 *Indemnification*

- A. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, AND IN ADDITION TO ANY OTHER OBLIGATIONS OF CONTRACTOR UNDER THE CONTRACT OR OTHERWISE, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ENGINEER, AND THE OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS AND

SUBCONTRACTORS OF EACH AND ANY OF THEM, FROM LOSSES, DAMAGES, COSTS, AND JUDGMENTS (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS, AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING FROM THIRD-PARTY CLAIMS OR ACTIONS RELATING TO OR RESULTING FROM THE PERFORMANCE OR FURNISHING OF THE WORK, PROVIDED THAT ANY SUCH CLAIM, ACTION, LOSS, COST, JUDGMENT OR DAMAGE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE, OR DEATH, OR TO DAMAGE TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF), INCLUDING THE LOSS OF USE RESULTING THEREFROM, BUT ONLY TO THE EXTENT CAUSED BY ANY NEGLIGENT ACT OR OMISSION OF CONTRACTOR, ANY SUBCONTRACTOR, ANY SUPPLIER, OR ANY INDIVIDUAL OR ENTITY DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM TO PERFORM ANY OF THE WORK, OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE.

- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals

furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;
 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

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

8.02 *Coordination*

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

8.03 *Legal Relationships*

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

utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) INDEMNIFY AND HOLD HARMLESS OWNER AND ENGINEER, AND THE OFFICERS, DIRECTORS, MEMBERS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS OF EACH AND ANY OF THEM FROM AND AGAINST ANY SUCH CLAIMS, AND AGAINST ALL COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO SUCH DAMAGE, DELAY, DISRUPTION, OR INTERFERENCE.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. For all Project and performance of Work matters, Owner will issue all communications to Contractor through Engineer. However, Owner may, at its discretion, issue communications related to the Project directly to Contractor. In all such direct communications, Owner will endeavor to copy Engineer.

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

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

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

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

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

- A. Within Thirty (30) days of executing the Agreement, Contractor may request, and Owner shall furnish, reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

9.12 *Safety Programs*

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

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract. Engineer does not have the authority to bind the Owner.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

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

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

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

11.03 *Work Change Directives*

- A. A Work Change Directive may be issued by the Owner if the change will not impact the Contract Price or Contract Times or if the Parties have not been able to agree on a Change Order and the Owner determines that the work of the change directive must be performed prior to memorialization of any impact to the Contract Price and Contract Times in a Change Order.
- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Owner or Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

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

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 - 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 - 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

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

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

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

B. *Change Proposal Procedures*

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

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

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. Engineer's action on a Change Proposal will not have the effect of adjusting the Contract Time or Contract Price without express written approval of Owner and a memorialization of Engineer's action in a Change Order. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that

as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

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

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

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

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

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

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those

additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the

material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:
 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 6. Expenses incurred in preparing and advancing Claims.
 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.
- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish

and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, to the extent prior Change Orders have not been executed allocated contingency allowances, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted with the balance of any unused contingencies reverting to Owner unless allocated differently elsewhere in the Contract Documents.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of

Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

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

14.03 *Defective Work*

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

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

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

- A. Engineer has the authority to recommend additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed. Owner has sole authority to act on Engineer's recommendation and order special inspection, testing, or uncovering of Work.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer and approved by Owner, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request and Owner's approval, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

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

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer or Owner to correct defective Work, or to remove and replace defective Work as required by Engineer or Owner, then Owner may, after 7 days' written notice to Contractor, make demand on Contractor's surety to perform as required in the performance bond issued for the Work, utilize its own forces, or hire a supplemental or replacement contractor to correct or remedy any such deficiency. In electing to exercise any remedy allowed under this Paragraph 14.07, Owner is not required to terminate Contractor's rights of continued performance for the entirety of the Work.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and all tools, equipment and materials stored or maintained at the Site, and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Owner and Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. Applications for Payments

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

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Completion Time and Liquidated Damages*

1. 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 Contract 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.

F. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the

specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

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

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. At that inspection, Owner and Engineer will review, supplement, and edit the initial punch list prepared by Contractor or prepare an additional punch list if Contractor has not yet provided a punch list. If Owner or Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Owner and Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent

property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
 - 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Owner or Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work will relieve Contractor of its insurance obligations under these Contract Documents.

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
 2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is

acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

- D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced.

Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.

- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work and all materials, equipment, and tools maintained or stored at the Site, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient. Owner shall have the right with respect to Contractor and Contractor's surety to demand performance of said surety within ten (10) days following termination. Further, Owner shall have the right to determine and/or approve and replacement contractor desired by Surety to correct and complete the Work.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. demobilization expenses; and.
- B. Contractor shall not be paid for any economic loss arising out of or resulting from such termination, except for the costs listed in 16.03(a).

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
 - 3. Claims expressly reserved by either Party pursuant to the Contract Documents.

- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. For any disputes subject to this article, Owner and Contractor shall endeavor to resolve their Claims by mediation. The Parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction.
 2. For any claim not resolved by mediation, the Parties agree to submit such claims to the jurisdiction of the District Court of Walker County, Texas for final dispute resolution.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

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

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

- B. The Contractor and Owner waive claims against each other for the following enumerated consequential damages arising out of or relating to this Contract. This mutual waiver includes and is expressly limited to the following:
 - 1. damages incurred by the Owner for lost revenue, profit, financing costs, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
 - 2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, bonding capacity, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state of Texas.

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

18.11 *Confidential Information*

- A. Confidential Information is defined as information which is determined by the transmitting party to be of a confidential or proprietary nature and: (a) the transmitting party identifies as

either confidential or proprietary; (b) the transmitting party takes steps to maintain the confidential or proprietary nature of the information; and (c) the document is not otherwise available in or considered to be in the public domain. The receiving party agrees to maintain the confidentiality of the Confidential Information and agrees to use the Confidential Information solely in connection with the Project.

- B. A party receiving Confidential Information may disclose the Confidential Information as required by law or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity. A party receiving Confidential Information may also disclose the Confidential Information to its employees, consultants or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of Confidential Information as set forth in this Contract.

18.12 *Texas Public Information Act*

- A. Contractor recognizes that this Project is publicly owned, and Owner is subject to the disclosure requirements of the Texas Public Information Act (the "PIA"). As part of its obligations within the Contract Documents, Contractor agrees, at no additional cost to Owner, to cooperate with Owner for any particular needs or obligations arising out of Owner's obligations under the PIA. This acknowledgement and obligation are in addition to and complimentary to Owner's audit rights in Paragraph 17.10.
- B. This provision applies if the Agreement has a stated expenditure of at least \$1 million in public funds for the purchase of goods or services by Owner or results in the expenditure of at least \$1 million in public funds for the purchase of goods or services by Owner in its fiscal year.
- C. Contractor must (1) preserve all contracting information related to the Agreement as provided by the records retention requirements applicable to Owner for the duration of the Agreement; (2) promptly provide to Owner any contracting information related to the Agreement that is in the custody or possession of Contractor on request of Owner; and (3) on completion of the Agreement, either:
 - 1. provide at no cost to Owner all contracting information related to the Agreement that is in the custody or possession of the Contractor; or
 - 2. preserve the contracting information related to the Agreement as provided by the records retention requirements applicable to Owner.
- D. The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to this Agreement and Contractor agrees that the Agreement can be terminated if Contractor knowingly or intentionally fails to comply with a requirement of that subchapter.

18.13 *Supremacy Clause*

- A. Notwithstanding anything herein to the contrary, if the Technical Specifications conflict with the General Conditions, the General Conditions control.
- B. With respect to the Contract Documents, the order of supremacy shall be as designated in the Agreement.

18.14 *Trust Funds*

- A. This Project is subject to the Texas Trust Fund Statute, chapter 162 of the Texas Property Code, and the Parties acknowledge that the payment obligations contained herein for

Contractor to receive funds from Owner and then use those funds to pay such Subcontractors, Suppliers, Vendors, Consultants, and the like, are subject to the Trust Fund Statute and Owner's audit rights outlined in this Article 17.

18.15 *Prevailing Wage*

- A. 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 Contractor or any subcontractor. Contractor shall provide and pay for labor in accordance with the prevailing wage in the locality and shall not pay less than the prevailing wage.

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Exhibit A to General Conditions
Owner's Insurance Requirements of Contractor

1. Specific Insurance Requirements

The following insurance shall be maintained in effect with limits not less than those set forth below at all times during the term of this Agreement and thereafter as required:

Insurance	Coverage/Limits	Other Requirements
Commercial General Liability (Occurrence Basis)	Amounts of coverage shall be no less than: <ul style="list-style-type: none"> ▪ \$1,000,000 Per Occurrence ▪ \$2,000,000 General Aggregate ▪ \$2,000,000 Products/Completed Operations Aggregate ▪ \$1,000,000 Personal And Advertising Injury ▪ Designated Construction Project(s) General Aggregate Limit 	<ul style="list-style-type: none"> ▪ Current ISO edition of CG 00 01 ▪ Additional insured status shall be provided in favor of Owner Parties on a combination of ISO forms CG 20 10 10 01 and CG 20 37 10101 or an equivalent. ▪ This coverage shall be endorsed to provide primary and non-contributing liability coverage. It is the intent of the parties to this Agreement that all insurance coverage required herein shall be primary to and will not seek contribution from any other insurance held by Owner Parties, with Owner Parties' insurance being excess, secondary and non-contributing. ▪ Stop Gap coverage shall be provided if any work is to be performed in a monopolistic workers' compensation state. ▪ The following exclusions/limitations (or their equivalent(s), are prohibited: <ul style="list-style-type: none"> ○ Contractual Liability Limitation CG 21 39 ○ Amendment of Insured Contract Definition CG 24 26 ○ Exclusion-Damage to Work Performed by Subcontractors On Your Behalf, CG 22 94 or CG 22 95 ○ Any Classification limitation ○ Any Construction Defect Completed Operations exclusion ○ Any endorsement modifying the Employer's Liability exclusion or deleting exception to it ○ Any endorsement modifying or deleting Explosion, Collapse or Underground coverage ○ Any Habitational or Residential exclusion applicable to the Work ○ Any "Insured vs. Insured" exclusion except Named Insured vs. Named Insured ○ Any Punitive, Exemplary or Multiplied Damages exclusion ○ Any Subsidence exclusion

Business Auto Liability	Amount of coverage shall be no less than: <ul style="list-style-type: none"> ▪ \$1,000,000 Combined Single Limit 	<ul style="list-style-type: none"> ▪ Current ISO edition of CA 00 01 ▪ Arising out of any auto (Symbol 1), including owned, hired and non-owned
Workers' Compensation and Employer's Liability	Amounts of coverage shall be no less than: <ul style="list-style-type: none"> ▪ Statutory Limits ▪ \$1,000,000 Each Accident and Disease ▪ Alternate Employer endorsement 	<ul style="list-style-type: none"> ▪ The State in which work is to be performed must listed under Item 3.A. on the Information Page ▪ Such insurance shall cover liability arising out of the Contractor's employment of workers and anyone for whom the Contractor may be liable for workers' compensation claims. Workers' compensation insurance is required, and no "alternative" forms of insurance shall be permitted. ▪ Where a Professional Employer Organization (PEO) or "leased employees" are utilized, Contractor shall require its leasing company to provide Workers' Compensation insurance for said workers and such policy shall be endorsed to provide an Alternate Employer endorsement in favor of Contractor and Owner. Where Contractor uses leased employees with Workers' Compensation insurance provided by a PEO or employee leasing company, Contractor is strictly prohibited from subletting any of its work without the express written agreement of Owner.
Excess Liability (Occurrence Basis)	Amounts of coverage shall be no less than: <ul style="list-style-type: none"> ▪ \$5,000,000 Each Occurrence 	<ul style="list-style-type: none"> ▪ Coverage shall "follow form" over underlying policies listed herein.
Professional Liability	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Each Claim ▪ \$2,000,000 Annual Aggregate ▪ If a combined Contractor's Pollution Liability and Professional Liability policy is utilized, the limits shall be \$3,000,000 Each Claim. ▪ Such insurance shall cover all services rendered by the Contractor and its consultants under the Agreement, including but not limited to design or design/build services. ▪ Policies written on a Claims Made basis shall be maintained for at least two years beyond termination of the Agreement. 	<ul style="list-style-type: none"> ▪ Such insurance shall cover all services rendered by the Contractor and its subcontractors under the Agreement. ▪ This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from: <ul style="list-style-type: none"> ○ bodily injury or property damage where coverage is provided on behalf of design professionals or design/build contractors ○ habitational or residential operations ○ mold and/or microbial matter and/or fungus and/or biological substance ▪ Any retroactive date must be effective prior to beginning of services for the Owner. ▪ Policies written on a Claims Made basis shall have an extended reporting period of at least two years beyond termination of the Agreement. Contractor shall trigger the extended reporting period if identical coverage is not otherwise maintained with the expiring retroactive date.

<p>Contractors Pollution Liability</p>	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Each Claim ▪ If a combined Contractor's Pollution Liability and Professional Liability policy is utilized, the limits shall be \$3,000,000 Each Claim. ▪ The policy must provide coverage for: <ul style="list-style-type: none"> ○ the full scope of the named insured's operations (on-going and completed) as described within the scope of work for this Agreement ○ loss arising from pollutants including but not limited to fungus, bacteria, biological substances, mold, microbial matter, asbestos, lead, silica and contaminated drywall ○ third party liability for bodily injury, property damage, clean up expenses, and defense arising from the operations; ○ diminution of value and Natural Resources damages ○ contractual liability ○ claims arising from non-owned disposal sites utilized in the performance of this Agreement. 	<ul style="list-style-type: none"> ▪ The policy must insure contractual liability, name Owner Parties as an Additional Insured, and be primary and noncontributory to all coverage available to the Additional Insured. ▪ This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from: <ul style="list-style-type: none"> ○ Insured vs. insured actions. However exclusion for claims made between insured within the same economic family are acceptable. ○ impaired property that has not been physically injured ○ materials supplied or handled by the named insured. However, exclusions for the sale and manufacture of products are allowed. Exclusionary language pertaining to materials supplied by the insured shall be reviewed by the certificate holder for approval. ○ property damage to the work performed by the contractor ○ faulty workmanship as it relates to clean up costs ○ work performed by subcontractors ▪ If coverage is provided on a Claims Made basis, coverage will at least be retroactive to the earlier of the date of this Agreement or the commencement of contractor services relation to the Work. ▪ The policy will offer an extended discovery or extended reporting clause of at least three (3) years. ▪ Completed Operations coverage shall be maintained through the purchase of renewal policies to protect the insured and additional insured for at least two (2) years after the property owner accepts the project or this contract is terminated. The purchase of an extended discovery period or an extended reporting period on a Claims Made policy or the purchase of occurrence-based Contractors Environmental Insurance will not be sufficient to meet the terms of this provision.
<p>Builders Risk</p>	<ul style="list-style-type: none"> ▪ Coverage shall be provided in an amount equal at all times to the full contract value, including change orders, and cost of debris removal for any single occurrence. ▪ Coverage shall be at least as broad as an unmodified ISO Special form, shall be provided on a completed value basis, and 	<ul style="list-style-type: none"> ▪ Insureds shall include Owner Parties, General Contractor, all Loss Payees and Mortgagees, and subcontractors of all tiers in the Work as Insureds. ▪ Such insurance shall cover: <ul style="list-style-type: none"> ○ all structure(s) under construction, including retaining walls, paved surfaces

	<p>shall be primary to any other insurance coverage available to the named insured parties, with that other insurance being excess, secondary and non-contributing.</p> <ul style="list-style-type: none"> ▪ The policy must provide coverage for: <ul style="list-style-type: none"> ○ Agreed Value Included ○ Damage arising from error, omission or deficiency in construction methods, design, specifications, workmanship or materials, including collapse Included ○ Debris removal additional limit \$1,000,000 ○ Earthquake and Earthquake Sprinkler Leakage \$5,000,000 ○ Flood Included ○ Freezing \$5,000,000 ○ Mechanical breakdown including hot & cold testing \$1,000,000 ○ Ordinance or law \$25,000 ○ Pollutant clean up and removal Included ○ Preservation of property Included ○ Theft \$10,000 ● Deductible shall not exceed 2% subject to \$50,000 ○ All Risks of Direct Damage, Per Occurrence, except minimum \$100,000 ○ Named Storm \$100,000 ○ Earthquake and Earthquake Sprinkler Leakage, Per Occurrence ○ Flood, Per Occurrence or excess of NFIP if in Flood Zone A or V 	<p>and roadways, bridges, glass, foundation(s), footings, underground pipes and wiring, excavations, grading, backfilling or filling;</p> <ul style="list-style-type: none"> ○ all temporary structures (e.g., fencing, scaffolding, cribbing, false work, forms, site lighting, temporary utilities and buildings) located at the site; ○ all property including materials and supplies on site for installation; ○ all property including materials and supplies at other locations but intended for use at the site; ○ all property including materials and supplies in transit to the site for installation by all means of transportation other than ocean transit; and ○ other Work at the site identified in the Agreement to which this Exhibit is attached. ● No protective safeguard warranty shall be permitted. ● The termination of coverage provision shall be endorsed to permit occupancy of the covered property being constructed. This insurance shall be maintained in effect, unless otherwise provided for the Agreement Documents, until the earliest of: <ul style="list-style-type: none"> ○ the date on which all persons and organizations who are insureds under the policy agree that it shall be terminated; ○ occupancy, in whole or in part; ○ the date on which release of substantial completion is executed; or ○ the date on which the insurable interests of Contractor in the Covered Property has ceased. ● A waiver of subrogation provision shall be provided in favor of all insureds listed above.
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2. General Insurance Requirements

A. Definitions. For purposes of this Agreement:

- i. "ISO" means Insurance Services Office.
- ii. "Contractor" shall include the Builder and its subcontractors of any tier.
- iii. "Owner Parties" means (a) City of Huntsville, Texas (collectively referred to as "Owner"), (b) the Project, (c) any lender whose loan is secured by a lien against the Work, (d) their respective shareholders, members, partners, joint venturers, affiliates, subsidiaries, successors and assigns, (e) any directors, officers, employees, or agents of such persons or entities, and (f) others as required by the Contract Documents.

B. Policies.

- i. Contractor shall maintain such Excess Liability, Professional and Pollution insurance in identical coverage, form and amount, including required endorsements, for at least two (2) years following Date of Substantial Completion of the Work to be performed under this Agreement. Contractor shall maintain such General Liability insurance in identical coverage, form and amount, including required endorsements, for at least ten (10) years following Date of Substantial Completion of the Work to be performed under this Agreement. Contractor shall provide written representation to Owner stating Work completion date.
- ii. All policies must:
 - a. Be written through insurance companies authorized to do business in the State in which the work is to be performed and rated no less than A-: VII in the most current edition of A. M. Best's Key Rating Guide at all times Work is to be performed.
 - b. Provide a waiver of subrogation in favor of Owner Parties on all insurance coverage carried by Contractor, whether required herein or not.
 - c. Contain an endorsement providing for thirty (30) days prior written notice of cancellation to Owner.
 - d. Be provided to the Owner Parties in compliance with the requirements herein and shall contain no endorsements that restrict, limit, or exclude coverage required herein in any manner without the prior express written approval of the Owner.
- iii. Failure of any Owner Party to demand such certificate or other evidence of full compliance with these insurance requirements or failure of any Owner Party to identify a deficiency from evidence that is provided shall not be construed as a waiver of the Contractor's obligation to maintain such insurance.
- iv. The Owner shall have the right to prohibit the Contractor or any subcontractor from performing any Work until such certificate of insurance, evidence of insurance and/or required endorsements are received and approved by the Owner.

C. Limits, Deductibles and Retentions

- i. No deductible or self-insured retention shall exceed \$25,000 without prior written approval of the Owner, except as otherwise specified herein. All deductibles and/or retentions shall be paid by, assumed by, for the account of, and at the Contractor's sole risk.

D. Evidence of Insurance.

The Contractor shall furnish evidence of insurance to Owner that confirms all required insurance policies are in full force and effect. Evidence of insurance shall be in a form acceptable to Owner.

Insurance must be evidenced as follows:

- i. ACORD Form 25 Certificate of Liability Insurance for liability coverages.
- ii. ACORD Form 28 Evidence of Commercial Property Insurance for property coverages.
- iii. Evidence shall be provided to Owner prior to commencing Work and prior to the expiration of any required coverage.
- iv. ACORD Forms specify:
 - a. Owner as certificate holder at Owner's mailing address;
 - b. Insured's name, which must match that on this Agreement;
 - c. Insurance companies producing each coverage and the policy number and policy date of each coverage;

- d. Producer of the certificate with correct address and phone number and have the signature of the authorized representative of the producer;
 - e. Additional Insured status in favor of Owner Parties;
 - f. Amount of any deductible or self-insured retention in excess of \$25,000;
 - g. Designated Construction Project(s) General Aggregate Limit;
 - h. Primary and non-contributory status;
 - i. Waivers of subrogation; and
 - j. All exclusions and limitations added by endorsement to the General Liability coverage. This can be achieved by attachment of the Schedule of Forms and Endorsements page.
- v. Copies of the following shall also be provided:
- a. General Liability Additional insured endorsement(s);
 - b. General Liability Schedule of Forms and Endorsements page(s); and
 - c. 30 Day Notice of Cancellation endorsement applicable to all required policies.

E. Contractor Insurance Representations to Owner Parties

- i. It is expressly understood and agreed that the insurance coverages required herein (a) represent Owner Parties' minimum requirements and are not to be construed to void or limit the Contractor's indemnity obligations as contained in this Agreement; and (b) are being, or have been, obtained by the Contractor in support of the Contractor's liability and indemnity obligations under this Agreement.
- ii. Failure to obtain and maintain the required insurance shall constitute a material breach of, and default under, this Agreement. In the event of any failure by the Contractor to comply with the provisions of this Agreement, the Owner may, without in any way compromising or waiving any right or remedy at law or in equity, on notice to the Contractor, purchase such insurance and offset all costs and expenses from the Contract Sum. Owner's exercise of this right shall not relieve or excuse Contractor from the obligation to obtain and maintain such insurance amounts and coverages.
- iii. This Exhibit is an independent contract provision and shall survive the termination or expiration of the Contract Agreement.

F. Insurance Requirements of Contractor's Subcontractors

- i. Insurance similar to that required of the Contractor shall be provided by all subcontractors (or provided by the Contractor on behalf of subcontractors) to cover operations performed under any subcontract agreement. The Contractor shall be held responsible for any modification in these insurance requirements as they apply to subcontractors. The Contractor shall maintain certificates of insurance from all subcontractors containing provisions similar to those listed herein (modified to recognize that the certificate is from subcontractor) enumerating, among other things, the waivers of subrogation, additional insured status, and primary liability as required herein, and make them available to the Owner upon request.
- ii. The Contractor is fully responsible for loss and damage to its property on the site, including tools and equipment, and shall take necessary precautions to prevent damage to or vandalism, theft, burglary, pilferage and unexplained disappearance of property. Any insurance covering the Contractor's or its subcontractor's property shall be the Contractor's and its subcontractor's sole and complete means or recovery for any such loss. To the extent any loss is not covered by said insurance or subject to any deductible or co-insurance, the Contractor shall not be reimbursed for same. Should the Contractor or its subcontractors choose to self-insure this risk, it is expressly agreed that the Contractor hereby waives, and shall cause its subcontractors to waive, any claim for damage or loss to said property in favor of the Owner Parties.

G. Use of the Owners Equipment

The Contractor, its agents, employees, subcontractors or suppliers shall use the Owners equipment only with express written permission of the Owners designated representative and in accordance with the Owners terms and condition for such use.

H. Release and Waiver

The Contractor hereby releases, and shall cause its subcontractors to release, the Owner Parties from any and all claims or causes of action whatsoever which the Contractor and/or its subcontractors might otherwise now or hereafter possess resulting in or from or in any way connected with any loss covered by insurance, whether required herein or not, or which should have been covered by insurance required herein, including the deductible and/or uninsured portion thereof, maintained and/or required to be maintained by the Contractor and/or its subcontractors pursuant to this Agreement. **THE FOREGOING RELEASE AND WAIVER APPLY EVEN IF THE LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE FAULT OR NEGLIGENCE OR STRICT LIABILITY OF THE OWNER PARTIES.**

"SAMPLE ONLY"



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):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE ③	NAIC #
INSURED ④	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 INSR	SUBR WVD	POLICY NUMBER ⑥	POLICY EFF (MM/DD/YYYY) ⑦	POLICY EXP (MM/DD/YYYY) ⑧	LIMITS ⑨
	GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC						EACH OCCURRENCE \$ DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$ \$
	AUTOMOBILE LIABILITY ⑩ <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> NON-OWNED AUTOS						COMBINED SINGLE LIMIT (Ea accident) \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
	UMBRELLA LIAB EXCESS LIAB OCCUR CLAIMS-MADE DED RETENTION \$						EACH OCCURRENCE \$ AGGREGATE \$ \$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below						WC STATUTORY LIMITS ⑪ OTH-ER \$ 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
	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
⑭ City Designated Contact: City of Huntville 1212 Ave M Huntville, TX 77340	

"SAMPLE ONLY"

Clear All

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. 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.

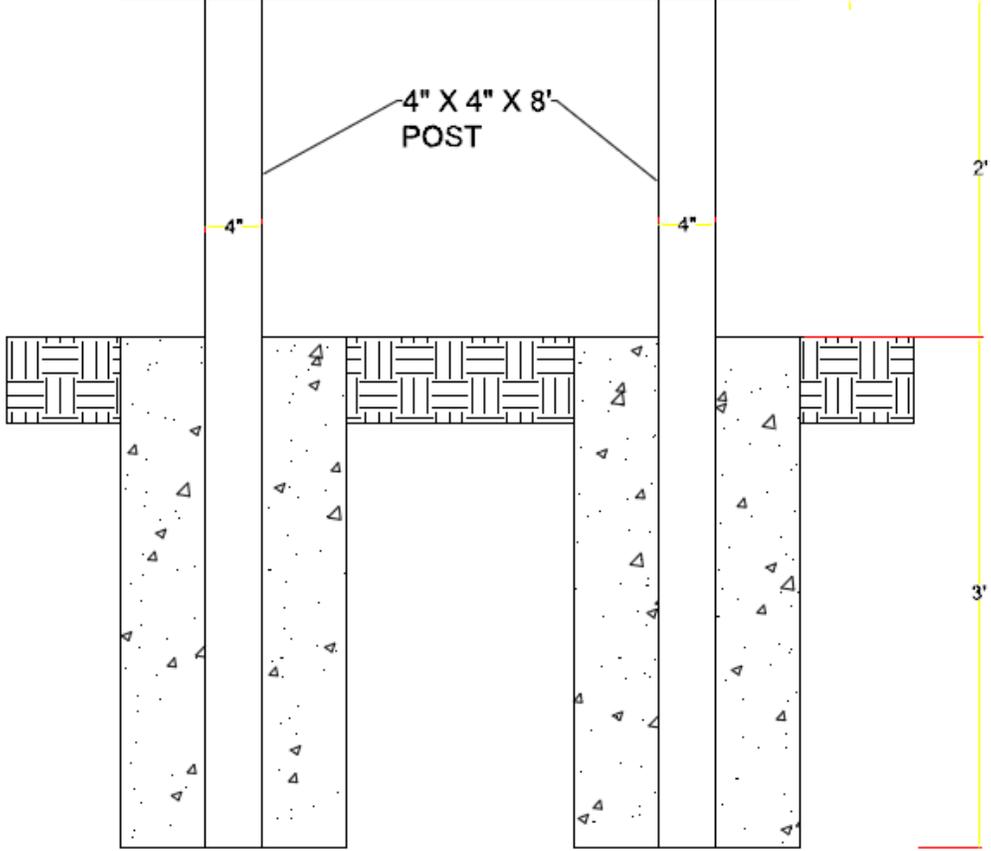
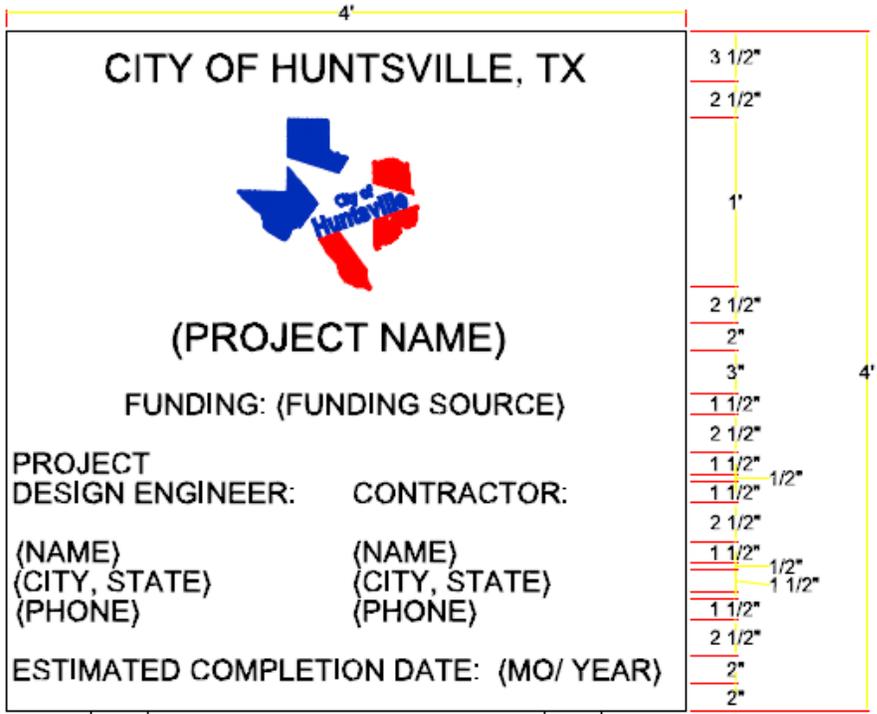
6. PROJECT INFORMATION SIGN

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.

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.

2. 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.
3. 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.
4. 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
5. 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.

SEE PROJECT SIGN EXAMPLE BELOW



PROJECT SIGN

7. 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

8. 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 omissions 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 in regards to 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.

9. 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 equally 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.

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. GAS AND ELECTRICITY FOR CONSTRUCTION

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

12. 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.

13. 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 sheer 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.

The fabric shall be fastened to the top strand of reinforcement by hog rings or cord at a maximum spacing of 15”.

- d) 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.

14. 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.

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.

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 not duly interfere with the progress of his work or the work of any other contractor; to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work;
- c) 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.
- d) 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;
- e) to effect all cutting, fitting or patching of his work required to make the same 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. 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.

18. 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.

19. 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.

20. 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).

21. 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.

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.

- 2) 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.

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.

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.

22. 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.

23. 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 FINAL COMPLETION unless otherwise called for on the plans or specifications. The CONTRACTOR warrants and guarantees for a period of one (1) year from the date of FINAL 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.

24. 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.

25. PAYMENT RETAINAGE

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

PART VII

Federal Labor Standards Provisions & Davis Bacon Wage Rates

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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 I(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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"General Decision Number: TX20230091 01/06/2023

Superseded General Decision Number: TX20220091

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).

<p>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:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
<p>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:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 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 2023.

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

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

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 DECISIO"

PART VIII

**MATERIAL AND CONSTRUCTION
SPECIFICATIONS**

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PART IX

Federal Register- Trench Safety

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§ 1926.606

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 waterfront 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

29 CFR Ch. XVII (7-1-07 Edition)

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.* (i) 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 America 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 ravelling, 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 1/2 horizontal to one vertical (1/2H: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°) 1 1/2 : 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.

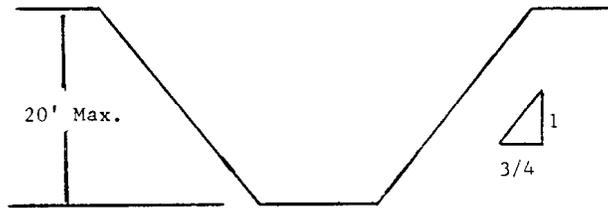
Figure B-1

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

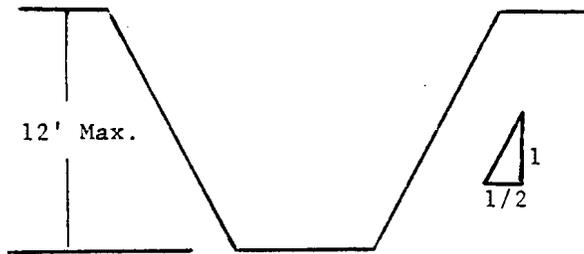
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$:1.



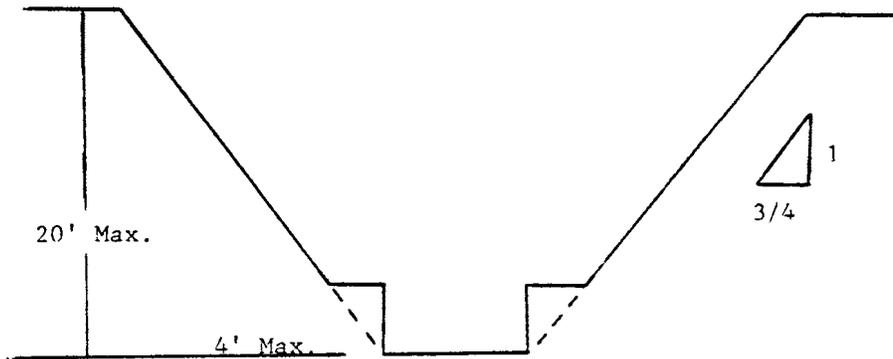
SIMPLE SLOPE—GENERAL

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.

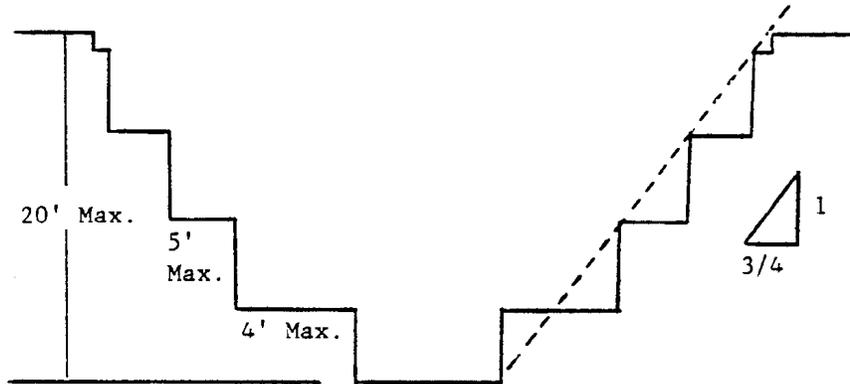


SIMPLE SLOPE—SHORT TERM

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:

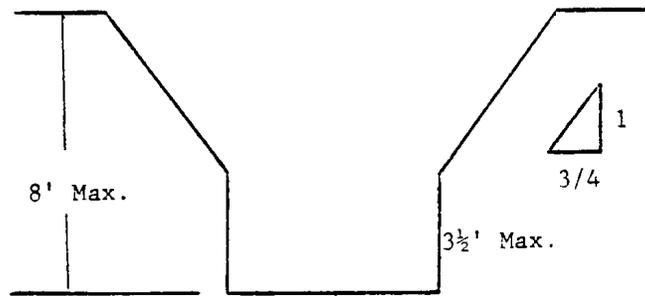


SIMPLE BENCH



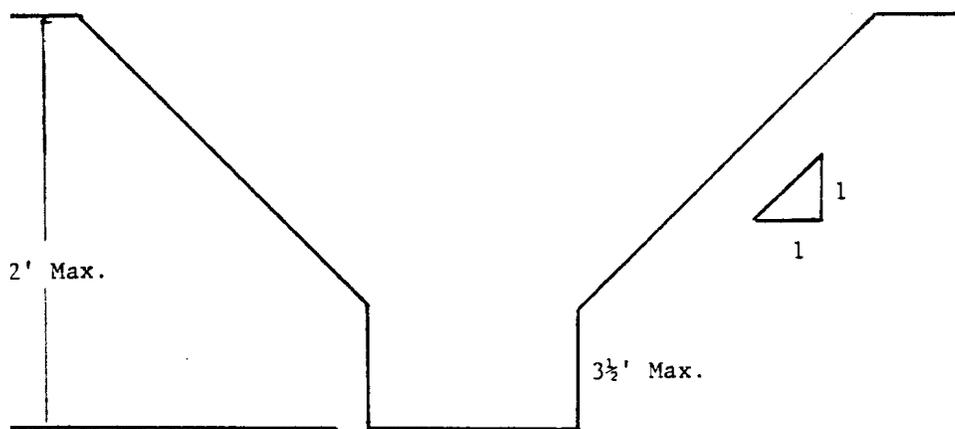
MULTIPLE BENCH

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.



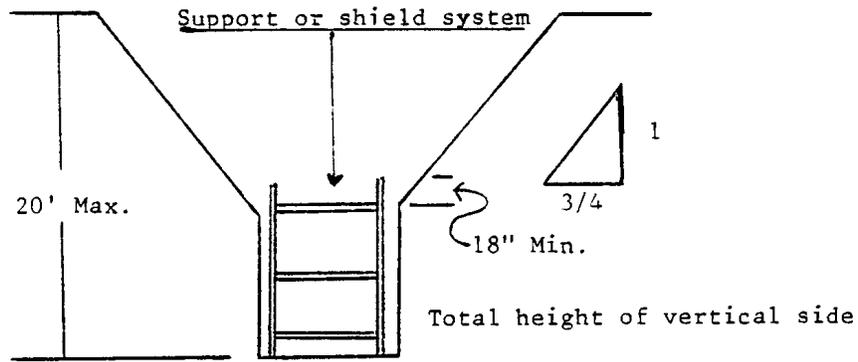
UNSUPPORTED VERTICALLY SIDED LOWER PORTION—MAXIMUM 8 FEET IN DEPTH

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.

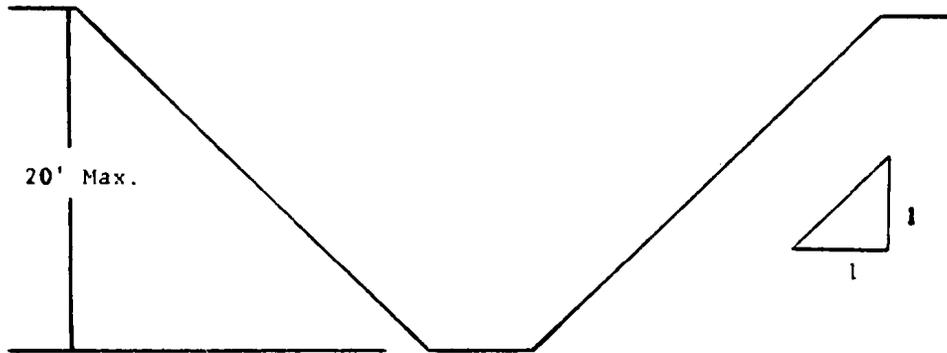


SUPPORTED OR SHIELDED VERTICALLY SIDED LOWER PORTION

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).

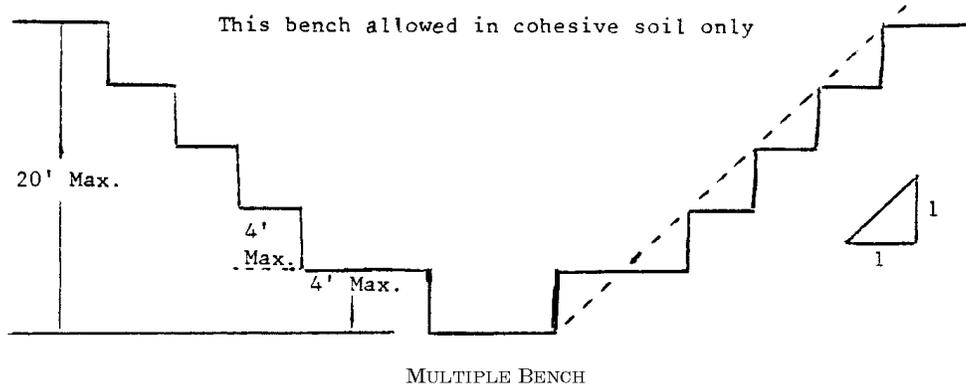
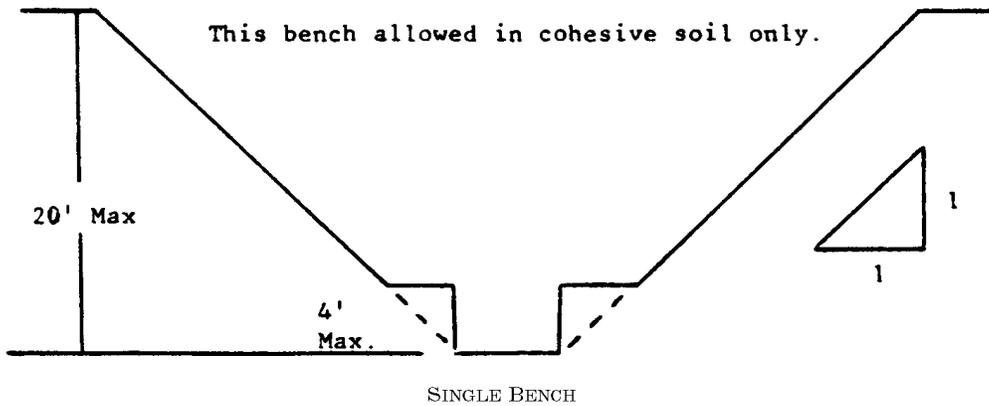
B-1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

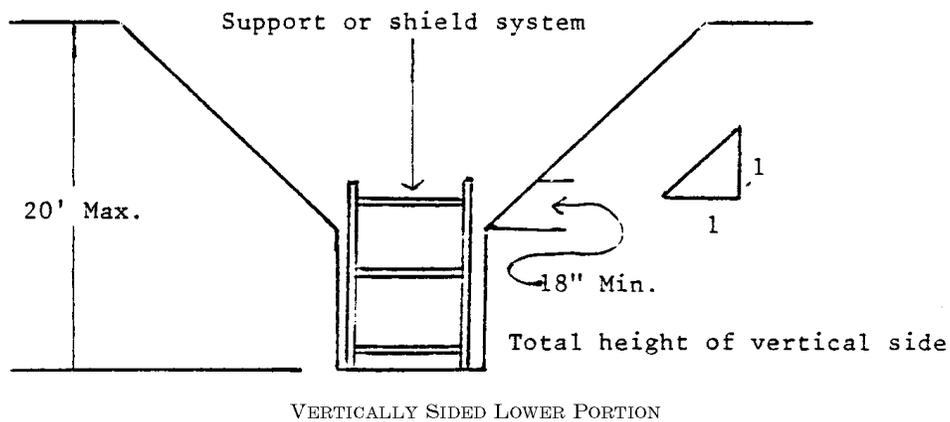


SIMPLE SLOPE

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:



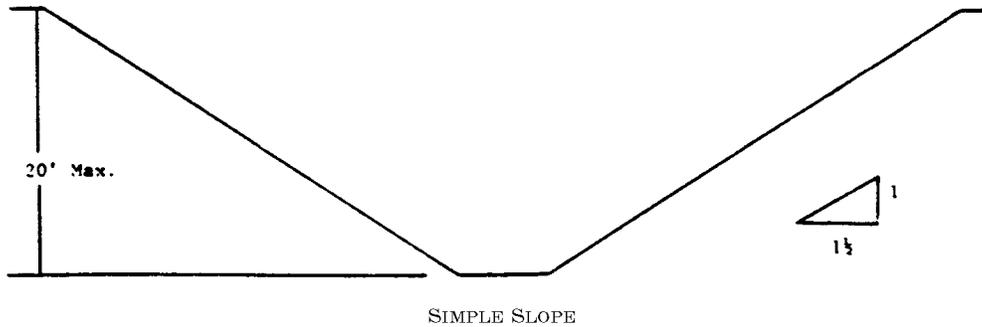
3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.



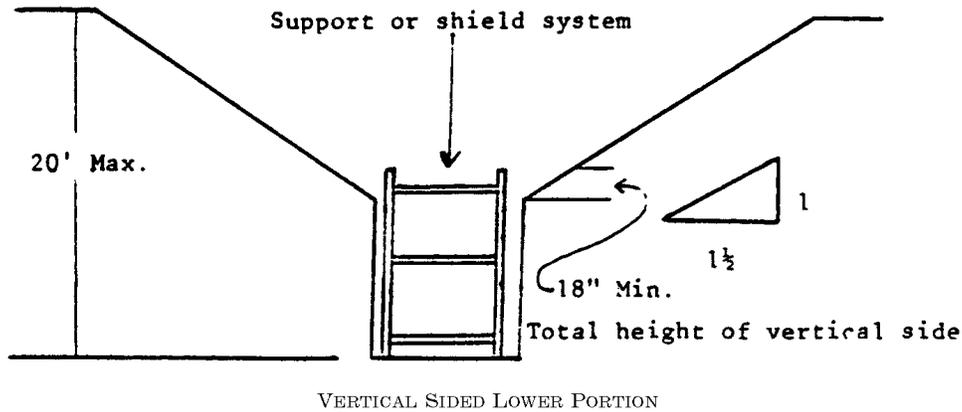
4. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

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.



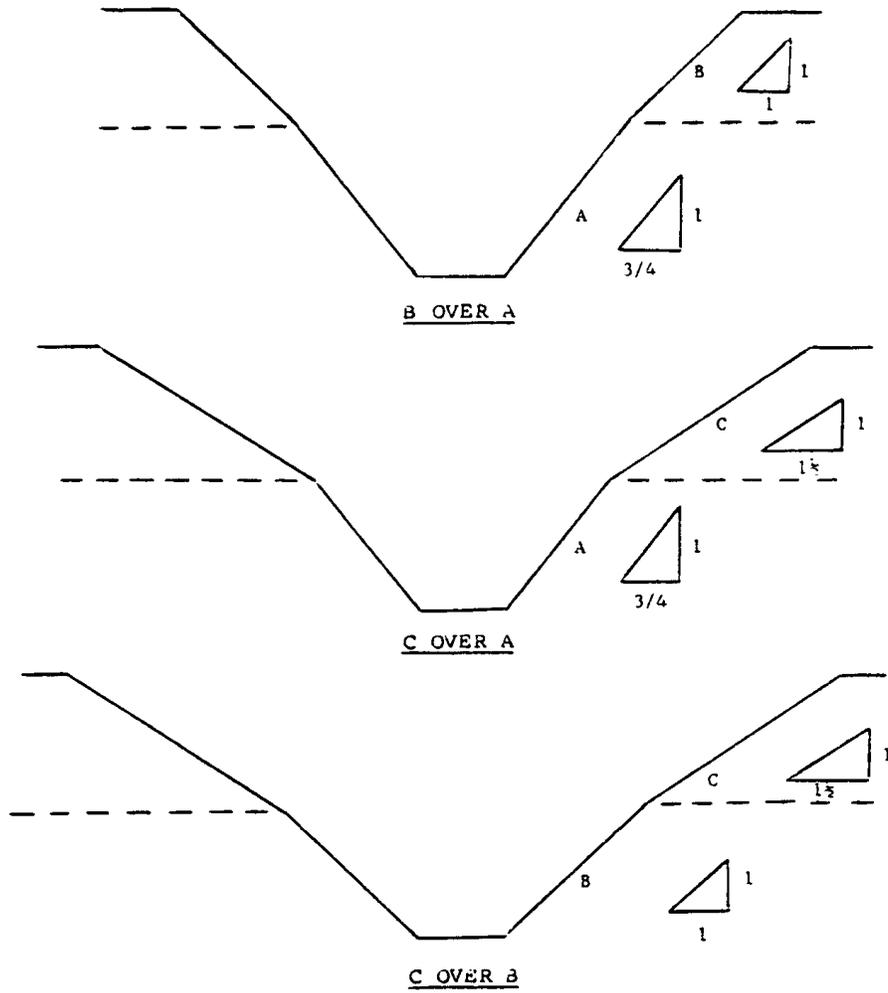
2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of $1\frac{1}{2}$:1.

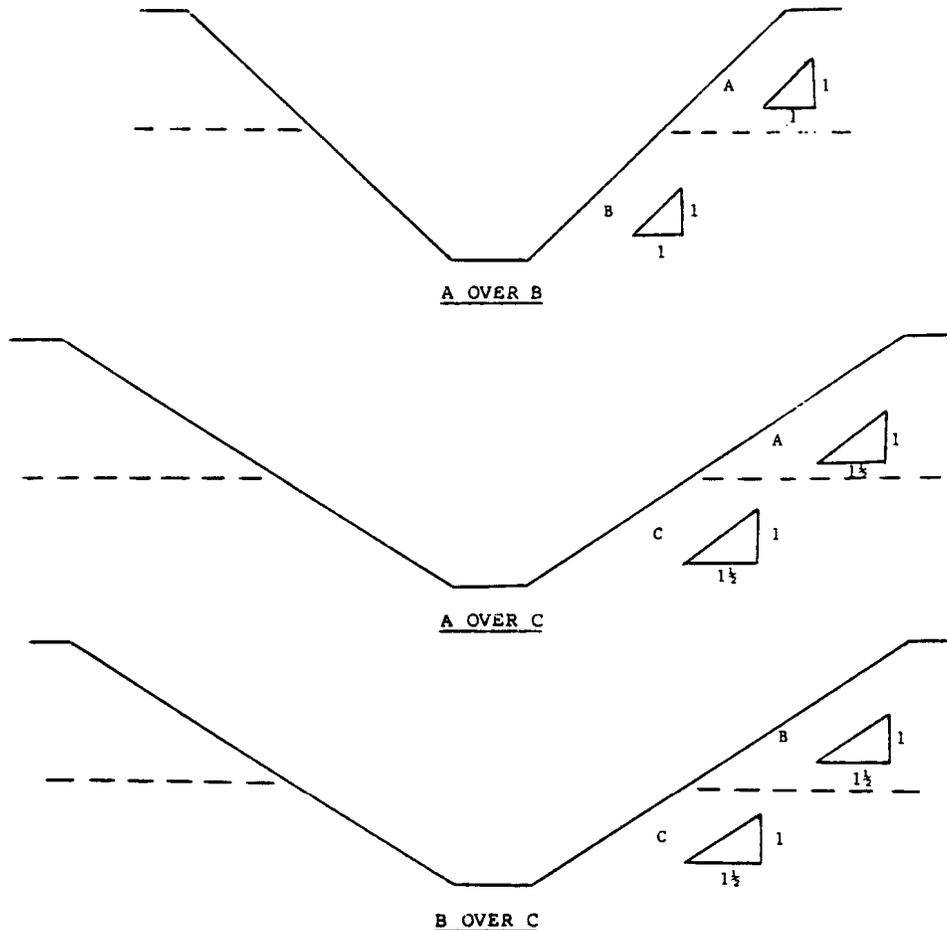


3. All other sloped excavations shall be in accordance with the other options permitted in §1926.652(b).

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							
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)			MAXIMUM ALLOWABLE HORIZONTAL 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	VERT. SPACING (FEET)	CLOSE	4	5	6	8
5	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---	---	---	---	---	---	---	---	---
T0	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	4	4	4	4	4	2X6	---	---
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4	4	4	4	4	4	2X6	---	---
10	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---	---	---	---	---	---	---	---	---
T0	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4	4	4	4	4	4	2X6	---	---
15	UP TO 10	6X6	6X5	6X6	6X8	6X8	4	8X10	4	4	4	4	4	4	2X6	---	---
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4	4	4	4	4	4	3X8	---	---
15	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	4	4	4	4	4	3X6	---	---
T0	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	4	4	4	4	4	3X6	---	---
20	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	4	4	4	4	4	3X6	---	---
OVER 20	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	4	4	4	4	4	3X6	---	---
	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 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**																	
	CROSS BRACES					WALES					UPRIGHTS							
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	CLOSE	2	3	MAXIMUM ALLOWABLE HORIZONTAL SPACING	2	3				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12										UP TO 15			
5	UP TO 6	4X6	4X6	6X6	6X6	6X6	6X8	5	6X8	5								
TO	8	6X6	6X6	6X6	6X8	6X8	8X10	5	8X10	5								
10	UP TO 10	6X6	6X6	6X6	6X8	6X8	10X10	5	10X10	5								
	See Note 1																	
10	UP TO 6	6X6	6X6	6X6	6X8	6X8	8X8	5	8X8	5								
TO	8	6X8	6X8	6X8	8X8	8X8	10X10	5	10X10	5								
15	UP TO 10	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5								
	See Note 1																	
15	UP TO 6	6X8	6X8	6X8	8X8	8X8	8X10	5	8X10	5								
TO	8	8X8	8X8	8X8	8X8	8X10	10X12	5	10X12	5								
20	UP TO 10	8X10	8X10	8X10	8X10	10X10	12X12	5	12X12	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**													UPRIGHTS		
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	CLOSE	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)					
		WIDTH OF TRENCH (FEET)														
UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	
5	6	6X8	6X8	6X8	8X8	8X8	8X8	5	8X10	5	2X6					
TO	8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6					
10	10	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	2X6					
		See Note 1														
10	6	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6					
TO	8	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	5	2X6					
15		See Note 1														
		See Note 1														
15	6	8X10	8X10	8X10	8X10	10X10	10X10	5	12X12	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-2.2

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	TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	CLOSE	2	3	4	6	
5	UP TO 6	TO 8	4X6	4X6	4X6	6X6	6X6	5	6X8	5	3X12 4X8		4X12
TO 10	UP TO 6	TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5	3X8	4X8	
TO 10	UP TO 6	TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5	4X8		
	See Note 1												
10	UP TO 6	TO 8	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6 4X10		
TO 15	UP TO 6	TO 10	6X8	6X8	8X8	8X8	8X8	5	10X10	5	3X6 4X10		
	See Note 1												
15	UP TO 6	TO 8	6X8	6X8	6X8	8X8	8X8	5	8X10	5	4X6		
TO 20	UP TO 6	TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	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 (SIZES) AND SPACING OF MEMBERS **											
	CROSS BRACES						WALES			UPRIGHTS		
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)		VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)		
	UP TO	TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	CLOSE			
5 TO 10	UP TO 6	6X6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	3X6	
	UP TO 8	6X6	6X6	6X6	6X6	6X6	8X8	5	10X10	5	3X6	
	UP TO 10	6X6	6X6	6X6	6X6	8X8	8X8	5	10X12	5	3X6	
	See Note 1											
10 TO 15	UP TO 6	6X8	6X8	6X8	6X8	6X8	8X8	5	10X10	5	4X6	
	UP TO 8	8X8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6	
	See Note 1											
	See Note 1											
15 TO 20	UP TO 6	8X8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	4X6	
	See Note 1											
	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 SHORING 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)

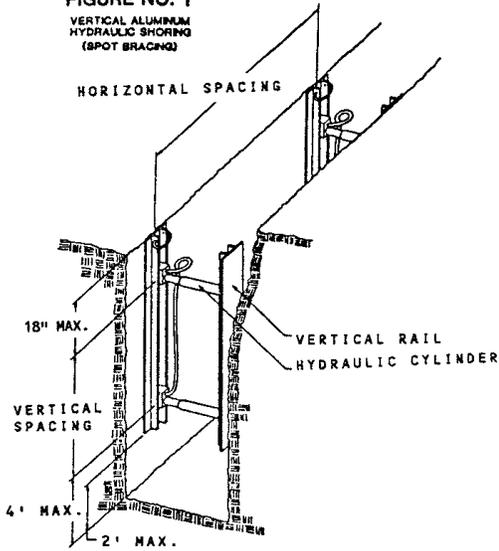


FIGURE NO. 2
VERTICAL ALUMINUM
HYDRAULIC SHORING
(WITH PLYWOOD)

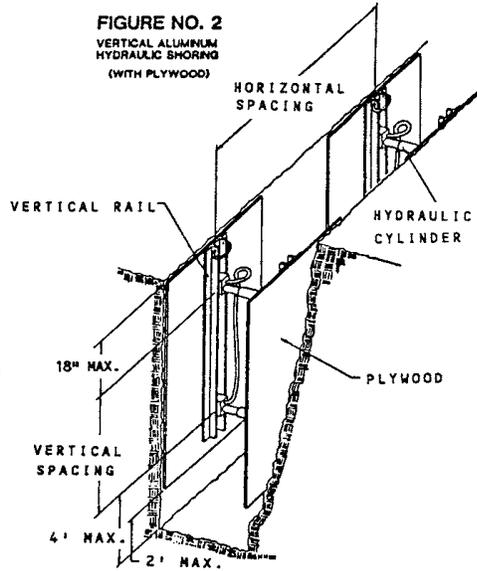


FIGURE NO. 3
VERTICAL ALUMINUM
HYDRAULIC SHORING
(STACKED)

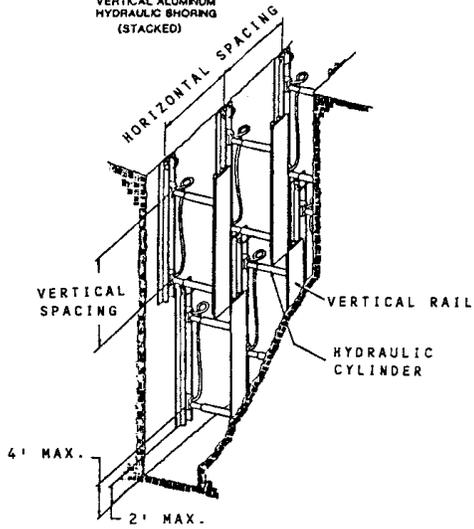


FIGURE NO. 4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEM
(TYPICAL)

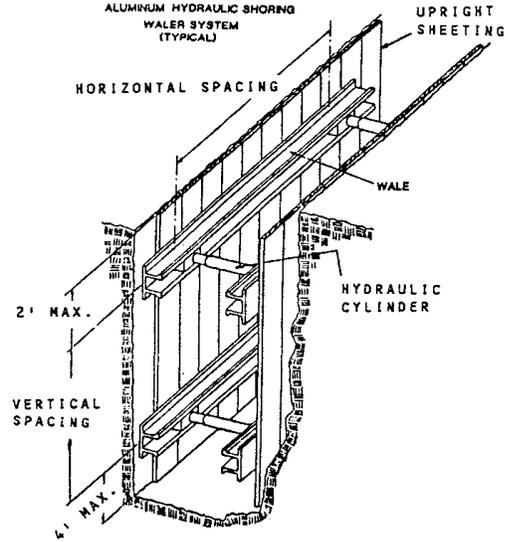


TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

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 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	3 INCH DIAMETER
OVER 10 UP TO 15	8		2 INCH DIAMETER NOTE (2)	
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

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS			WIDTH OF TRENCH (FEET)	DIAMETER
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)			
OVER 5 UP TO 10	8	4	UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 10 UP TO 15	6.5		2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
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	2 FT.	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	8.0	3 IN		
			9.0	2 IN	9.0	NOTE(2)	9.0	3 IN		
			12.0	3 IN	12.0	3 IN	12.0	3 IN		3x12
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN	6.0	3 IN		
			8.0	3 IN	8.0	3 IN	8.0	3 IN		3x12
			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	NOTE(2)	5.5	3 IN		
			6.0	3 IN	6.0	3 IN	6.0	3 IN		3x12
			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	UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15	SOLID SHEET	2 FT.	3 FT.	
OVER 5 UP TO 10	4	3.5	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	3 IN	3x12	—	
			6.0	2 IN	6.0	NOTE(2)	6.0	3 IN				
			6.5	2 IN	6.5	NOTE(2)	6.5	3 IN				
OVER 10 UP TO 15	4	7.0	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	3 IN	3x12	—	
			10.0	3 IN	10.0	3 IN	10.0	3 IN				
			4.0	2 IN	4.0	NOTE(2)	4.0	3 IN				
OVER 15 UP TO 20	4	14.0	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	3 IN	3x12	—	
			5.5	3 IN	5.5	3 IN	5.5	3 IN				
			8.0	3 IN	8.0	3 IN	8.0	3 IN				
OVER 20	4	3.5	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	3 IN	3x12	—	
			3.5	2 IN	3.5	NOTE(2)	3.5	3 IN				
			7.0	3 IN	5.0	3 IN	5.0	3 IN				
OVER 20		14.0	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	3 IN	3 IN	6.0	3 IN

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

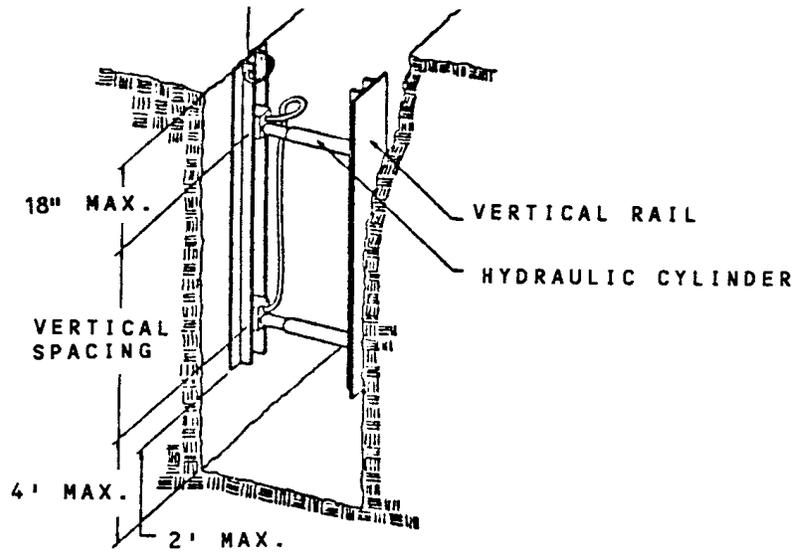


Figure 2. Pneumatic/hydraulic Shoring

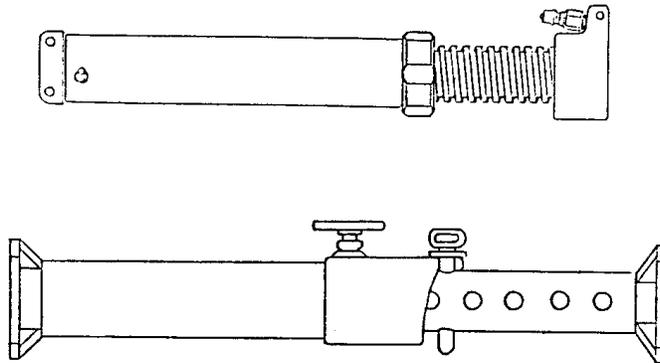


Figure 3. Trench Jacks (Screw Jacks)

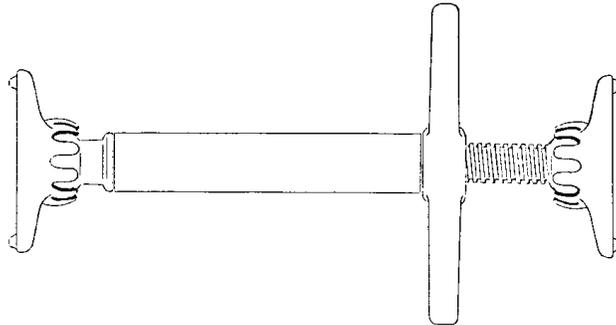
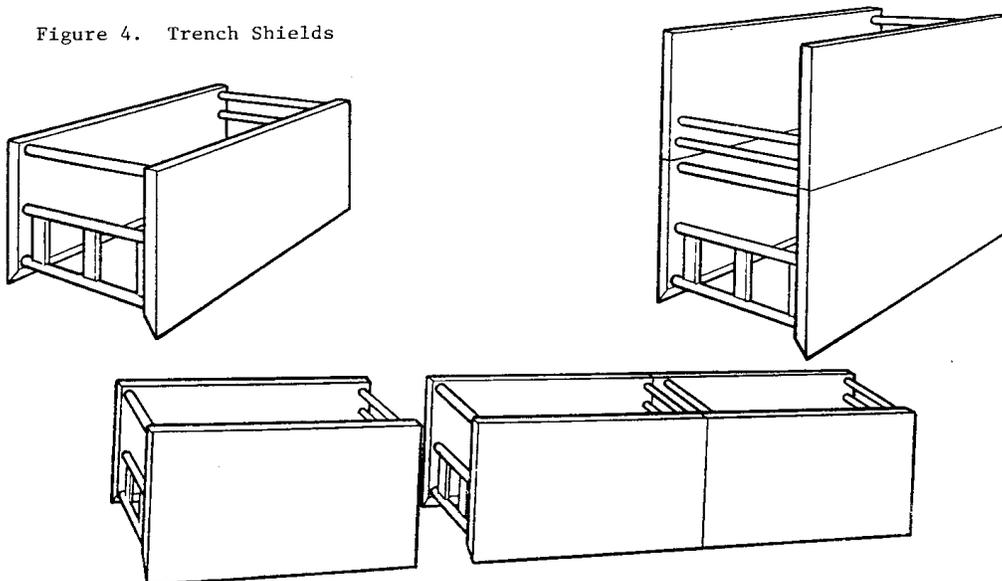


Figure 4. Trench Shields



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).

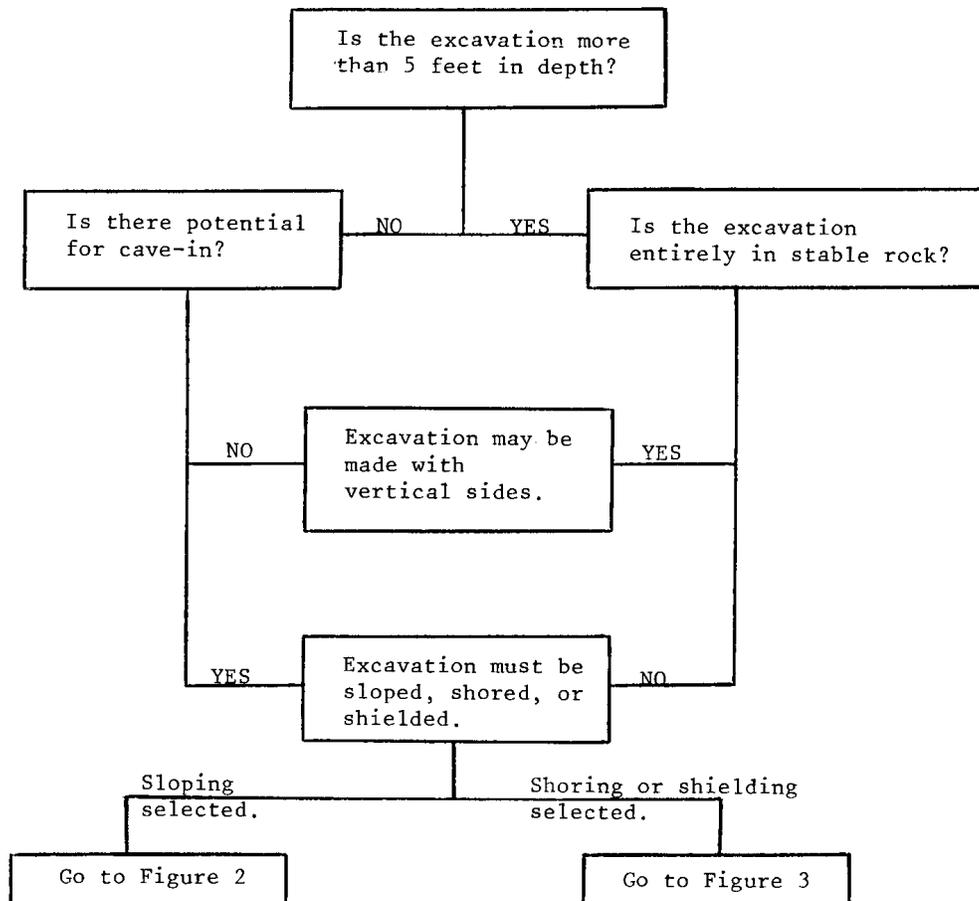


FIGURE 1 - PRELIMINARY DECISIONS

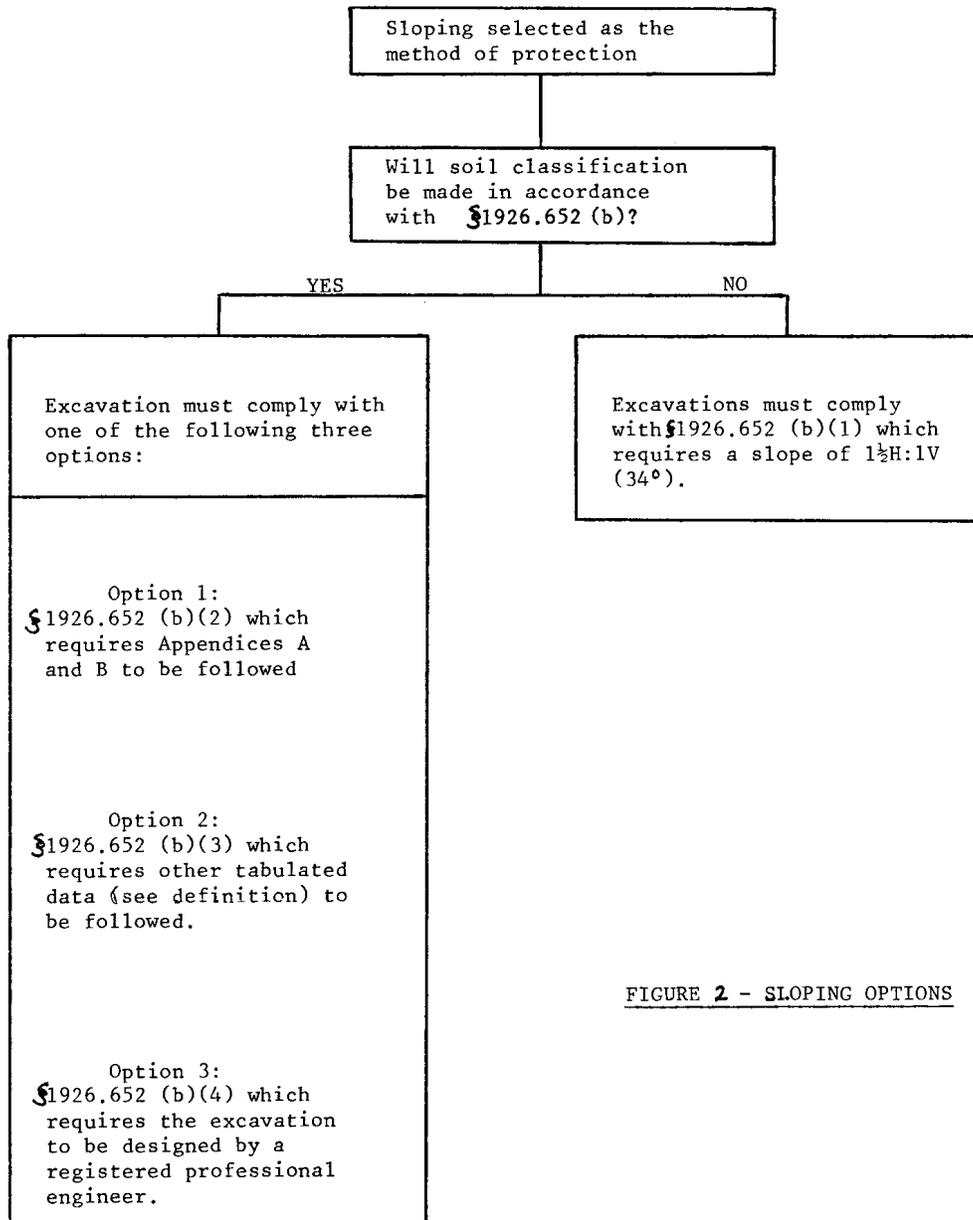


FIGURE 2 - SLOPING OPTIONS

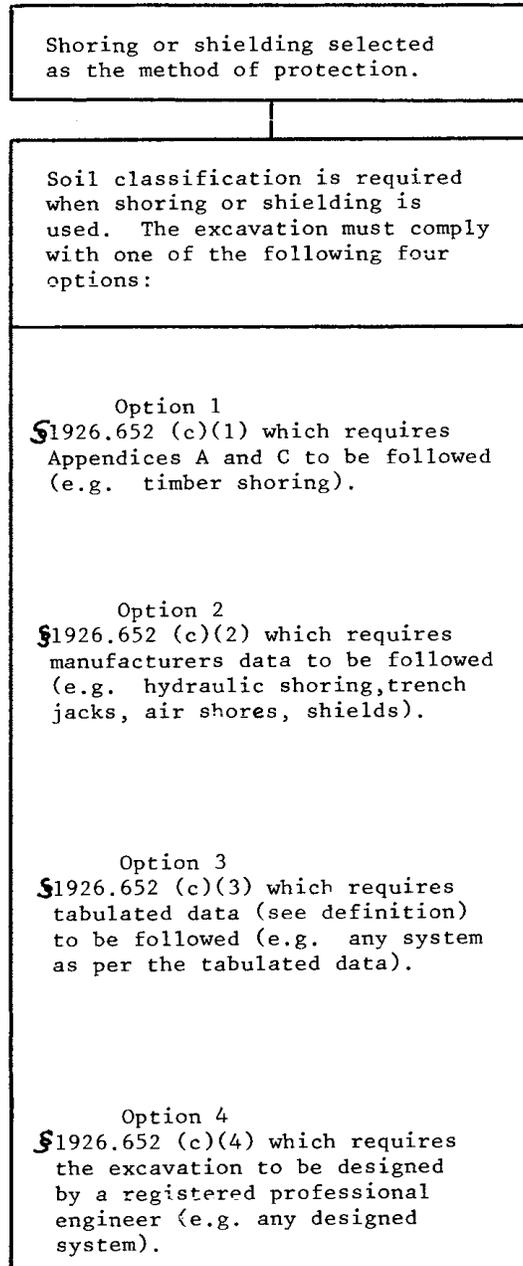


FIGURE 3 - SHORING AND SHIELDING OPTIONS

PART X

TECHNICAL SPECIFICATIONS

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CONTRACT SPECIFICATIONS
LJA PROJECT NO. E243-0010

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1533	Barricades, Signs, and Traffic Handling
1541	Trench Safety Systems
1563	Control of Ground Water and Surface Water
1578	Traffic Paint Striping
1582	Traffic Paint
2102	Clearing and Grubbing
2107	Turf Establishment
2210	Site Grading
2221	Excavation, Trenching and Backfilling for Utilities
2224	Encasing, Augering, and Tunneling
2227	Waste Material Disposal
2230	Roadway Excavation
2245	Lime-Stabilized Subgrade
2500	Storm Sewers
2513	Hot-Mix Asphaltic Concrete Pavement
2515	Concrete Pavement
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2560	Sanitary Sewers
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ITEM 1400

MEASUREMENT AND PAYMENT

MEASUREMENT AND PAYMENT: It is the intent of the Proposal and of the General and Supplementary Conditions that the total bid, as submitted, shall cover all work required by these Contract Documents. All costs in connection with the work, including furnishing of all materials, appliances, equipment, chemicals, supplies and appurtenances; providing all construction equipment and tools; and performing all necessary labor to fully complete the work shall be included in the unit prices in the Proposal. No item of work that is required by the Contract Documents for the proper and successful completion of the Contract will be paid for outside of or in addition to the prices submitted to the Proposal. **All work not specifically set forth in the Proposal as a pay item shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices named in the Proposal.**

The method of measurement and basis of payment shall be as stipulated in the following subparagraphs:

BASE BID ITEMS

1. Remove Existing Reinforced Concrete Sidewalk; Bid Item 1:

Measurement shall be "Per Square Yard". Unit price shall be full compensation for excavation, saw-cutting, removal of existing reinforced concrete sidewalk, disposal of removed materials off-site, and any incidentals necessary to complete the work.

2. Remove Existing Reinforced Concrete Curb and Gutter; Bid Item 2:

Measurement shall be "Per Linear Foot". Unit price shall be full compensation for excavation, saw-cutting, removal of existing reinforced concrete curb and gutter, disposal of removed materials off-site, and any incidentals necessary to complete the work.

3. Remove Existing Asphalt Pavement and Base; Bid Item 3:

Measurement shall be "Per Square Yard". Unit price shall be full compensation for excavation, saw-cutting, removal of existing asphalt pavement and base, disposal of removed materials off-site, and any incidentals necessary to complete the work.

4. Remove Existing Asphalt Driveway and Base; Bid Item 4:

Measurement shall be "Per Square Yard". Unit price shall be full compensation for excavation, saw-cutting, removal of existing asphalt driveway and base, disposal of removed materials off-site, and any incidentals necessary to complete the work.

5. Remove Existing Storm Sewer; Bid Item 5:

Measurement shall be “Per Linear Foot.” The unit price shall be full compensation for the removal of drainage culverts, all sizes, all types, disposal of removed materials off-site, bypass pumping, trench dewatering, and any incidentals necessary to complete the work.

6. Remove Existing Storm Sewer Junction Box; Bid Item 6:

Measurement shall be “Per Each.” The unit price shall be full compensation for the removal of reinforced concrete junction box, disposal of removed materials off-site, bypass pumping, trench dewatering, and any incidentals necessary to complete the work.

7. 24-Inch Reinforced Concrete Storm Sewer, ASTM C-76, Class III; Bid Item 7:

Measurement shall be “Per Linear Foot” along centerline of pipe from start to line terminus. The unit price shall be full compensation for layout, clearing and grubbing, trenching and incidentals thereto, bedding, pipe materials, pipe placement, backfill to existing grade, testing, connections, trench backfill, maintenance, clean-up, bypass pumping, trench/well point dewatering, and all incidental work required for the complete contract not specifically included in another payment item.

8. Reinforced Concrete Junction Box with Manhole Access; Bid Item 8:

Measurement shall be “Per Each.” The unit price shall be full compensation for layout, materials, installation of materials necessary, excavation, disposal of waste, seal slabs, access manhole frame with solid cover, forming, steel placement, placement of concrete, connections to all existing and proposed storm sewer, and appurtenances as shown on the Plans and/or Details, embedment and backfill, finish grading, clean-up, bypass pumping trench/well point dewatering, and any incidentals necessary to complete the work.

9. Connection of Proposed 24-Inch Reinforced Concrete Pipe Storm Sewer to Existing Reinforced Box Culvert; Bid Item 9:

Measurement shall be “Per Each.” The unit price shall be full compensation for layout, materials, installation of materials necessary, excavation, disposal of waste, seal slabs, forming, steel placement, placement of concrete, connection of proposed storm sewer culvert to existing box culvert, and appurtenances as shown on the Plans and/or Details, embedment and backfill, finish grading, clean-up, bypass pumping trench/well point dewatering, and any incidentals necessary to complete the work.

10. Trench Safety System; Bid Item 10:

Measurement shall be “Per Linear Foot” along the centerline of the pipe without deductions for manholes, valves, or fittings from start to line terminus for gravity and/or pressure systems for all depths in excess of 5 foot. The unit price shall be full compensation for trench safety system, material construction, maintenance and inspection of any shoring related equipment.

11. Reinforced Concrete Sidewalk, 4 1/2-Inch Thick, and Base; Bid Item 11:

Measurement shall be “Per Square Yard”. The unit price shall be full compensation for furnishing all labor, tools, equipment, and supplies, including layout, adjusting elevation of new sidewalk using cement stabilized sand, forming, reinforcement including dowels, supply and installation of concrete, joints, trenching and incidentals thereto, temporary driveway access, salvaging, transporting, and delivering the material, as required, and any incidentals necessary to complete the work.

12. Reinforced Concrete Curb and Gutter; Bid Item 12:

Measurement shall be “Per Linear Foot”. The unit price shall be full compensation for furnishing all labor, tools, equipment, and supplies, including layout, adjusting elevation of new curb and gutter using cement stabilized sand, forming, reinforcement including dowels, supply and installation of concrete, joints, trenching and incidentals thereto, temporary driveway access, salvaging, transporting, and delivering the material, as required, and any incidentals necessary to complete the work.

13. Reinforced Concrete Gutter; Bid Item 13:

Measurement shall be “Per Linear Foot”. The unit price shall be full compensation for furnishing all labor, tools, equipment, and supplies, including layout, adjusting elevation of new gutter along driveway using cement stabilized sand, forming, reinforcement including dowels, supply and installation of concrete, joints, trenching and incidentals thereto, temporary driveway access, salvaging, transporting, and delivering the material, as required, and any incidentals necessary to complete the work.

14. Asphalt Surface Restoration; Bid Item 14:

Measurement shall be “Per Square Yard”. Payment shall be for furnishing all materials including prime coat, and asphalt base grade-2 PG-64, per TXDOT Item 292, and hot-mix hot laid surface coarse type ”D” per TXDOT Item 340, required equipment and labor. Pavement shall be for repaired areas where removal was required for construction. Pavement replacement shall not exceed the areas shown on the plans. Other damaged areas shall be repaired at Contractor’s expense.

15. Traffic Control; Bid Item 15:

Measurement is to be “Per Lump Sum”. Payment to be full compensation for all necessary permits for flagmen necessary to assist in the unloading of construction materials (when and if necessary). The cost shall also include the installation, maintenance, and removal of all signs, temporary barricades along driveways, flagmen along adjoining streets during construction activities, along with all other appurtenances necessary.

16. SWPPP; Bid Item 16:

Measurement shall be “Per Lump Sum”. The unit price shall be full compensation for supplying materials, installation of SWPPP, maintenance of SWPPP, and removal of SWPPP at the end of construction, finish grading, clean-up, and all incidental work in accordance with Best Management Practices.

SUPPLEMENTARY BID ITEMS

17. “Extra” Bank Sand, As Directed by Owner’s Representative; Supplemental Bid Item 17:

Measurement shall be “Per Cubic Yard”. Payment shall be full compensation for supplying all materials to deliver bank sand, labor to place bank sand as directed by the Owner’s representative.

18. “Extra” Crushed Limestone Bedding, As Directed by Owner’s Representative; Supplemental Bid Item 18:

Measurement shall be “Per Cubic Yard”. Payment shall be full compensation for supplying all materials to deliver crushed limestone bedding, labor to place crushed limestone bedding as directed by the Owner’s representative.

19. “Extra” Cement Stabilized Sand, 2.0 Sacks per Ton, As Directed by Owner’s Representative; Supplemental Bid Item 19:

Measurement shall be “Per Ton”. Payment shall be full compensation for supplying all materials to deliver cement stabilized sand, labor to place cement stabilized sand as directed by the Owner’s representative.

20. “Extra” Class A Concrete, As Directed by Owner’s Representative; Supplemental Bid Item 20:

Measurement shall be “Per Cubic Yard”. Payment shall be full compensation for supplying all materials to deliver class A concrete, labor to place class A concrete as directed by the Owner’s representative.

21. “Extra” Reinforcing Steel, As Directed by Owner’s Representative; Supplemental Bid Item 21:

Measurement shall be “Per Pound”. Payment shall be full compensation for supplying all materials to deliver Reinforcing Steel, and labor to place steel as directed by the Owner’s representative.

22. “Extra” Turf Establishment, Full Sodding, As Directed by Owner’s Representative; Supplemental Bid Item 22:

Measurement shall be “Per Square Yard”. Payment shall be full compensation for

supplying all materials to deliver sodding, labor to place sodding, and water sodding as directed by the Owner's representative.

23. Waterline, Open Cut, As Directed by Owner's Representative; Supplemental Bid Item 23:

Measurement shall be "Per Linear Foot" along centerline of pipe without deductions for valves and fittings, from start to line terminus. The unit price shall be full compensation for layout, clearing and grubbing, trenching and incidentals thereto, bank sand bedding, pipe and mechanical joint fitting materials, steel pipe sections (as applicable), pipe placement, tracer wire, thrust blocking and normal backfill to existing grade, testing, disinfection, connections, trench backfill, maintenance, clean-up, trench/well point dewatering, and any incidentals required to complete the work as directed by the Owner's representative.

24. Gate Valves, As Directed by Owner's Representative; Supplemental Bid Item 24:

Measurement "Per Each". Payment includes valve with resilient seats, manual operator of type specified, accessories, adjustable valve box, setting, valve blocking, and any incidentals required to complete the work as directed by the Owner's representative.

25. Wet Connections, As Directed by Owner's Representative; Supplemental Bid Item 25:

Measurement shall be "Per Each". Unit price shall be full compensation for excavation, dewatering, cutting, cleaning, fittings, blocking, appurtenances and any incidentals including locating and closing valves necessary for line isolation, and cutting and plugging of existing pipes to be abandoned as necessary, and any incidentals required to complete the work as directed by the Owner's representative.

26. Connection of Existing Water Service Line (2-Inch or Less) to New Waterline, As Directed by Owner's Representative; Supplemental Bid Item 26:

Measurement shall be "Per Each". Payment shall be full payment for tapping of the line through service saddle with corporation stop, temporary capping of stop, installing new service line, excavating trench for new service, laying new service tubing from service line to the new waterline, connecting new service line to the existing service line, brass adapters as necessary, backfilling trench, and clean-up. No adjustment in the unit price shall be made for varying service line footage.

27. Connection of Existing Water Service Line (4-Inch and Greater) to New Waterline, As Directed by Owner's Representative; Supplemental Bid Item 27:

Measurement shall be "Per Each". Payment shall be full payment for tapping of the line through tapping sleeve and valve or tee with valve, installing new service line, excavating trench for new service, laying new piping from service line to the new waterline, connecting new service line to the existing service line, adapters as necessary, backfilling trench, and clean-up. No adjustment in the unit price shall be made for varying service

line footage.

28. Insertion Valves, As Directed by Owner's Representative; Supplemental Bid Item 28:

Measurement shall be "Per Each". Payment includes valve with resilient seats, manual operator of type specified, accessories, adjustable valve box, setting, concrete collar, and incidental work as directed by the Owner's representative.

29. Remove and Replace Existing Sanitary Sewer, As Directed by Owner's Representative; Supplemental Bid Item 29:

Measurement shall be "Per Linear Foot" along centerline of pipe without deductions for valves and fittings, from start to line terminus. The unit price shall be full compensation for layout, clearing and grubbing, trenching and incidentals thereto, sewer flow control and bypass pumping, pipe and shielded fernco couplings, pipe placement, cement stabilized bedding and backfill to existing grade, surface restoration, testing, disinfection, connections, trench backfill, maintenance, clean-up, trench dewatering, control of ground water & surface water, and all incidental work required for installation. Unit price bid shall also include but not be limited to: removal and replacement (with existing or new) of street signs and mailboxes; removal and disposal of existing surface as required including full depth saw-cut prior to removal; excavation, hauling and disposal of excavated material; bedding and backfill; surface restoration of asphalt and concrete pavement/drives, concrete sidewalks, concrete curbs and gutters, and gravel drives; all required drilling and doweling into existing concrete curb, sidewalk, and pavement; repair of adjacent street, concrete sidewalks, concrete curbs and gutters, or pavement structure damage by these operations; and all equipment, labor, materials, tools, incidentals, and all appurtenances necessary to complete the replacement.

30. Reinforced Concrete Conflict Manhole with Access Cover, As Directed by Owner's Representative; Supplemental Bid Item 30:

Measurement shall be "Per Each". The unit price shall be full compensation for layout, clearing and grubbing, trenching and incidentals thereto, sewer flow control and bypass pumping, storm sewer manhole, pipe and shielded fernco couplings, pipe placement, cement stabilized bedding and backfill to existing grade, surface restoration, testing, disinfection, connections, trench backfill, maintenance, clean-up, trench dewatering, control of ground water & surface water, and all incidental work required for installation. Unit price bid shall also include but not be limited to: removal and replacement (with existing or new) of street signs and mailboxes; removal and disposal of existing surface as required including full depth saw-cut prior to removal; excavation, hauling and disposal of excavated material; bedding and backfill; surface restoration of asphalt and concrete pavement/drives, concrete sidewalks, concrete curbs and gutters, and gravel drives; all required drilling and doweling into existing concrete curb, sidewalk, and pavement; repair of adjacent street, concrete sidewalks, concrete curbs and gutters, or pavement structure damage by these operations; and all equipment, labor, materials, tools, incidentals, and all appurtenances necessary to complete the replacement.

ITEM 1533

BARRICADES, SIGNS, AND TRAFFIC HANDLING - NO TCP

I. GENERAL

A. Description

This Item shall consist of providing, installing, moving, replacing, maintaining, cleaning and removing from the site, all barricades, signs, lights, and all other devices for controlling and handling traffic as indicated in the Plans and/or Exhibits or as directed by the Engineer.

B. Related Work (if utilized in this project)

1. Item 2221 - Excavation, Trenching and Backfilling for Utilities
2. Item 2600 - Repair of Asphalt Paving

II. MATERIALS

All barricades, signs, lights and other types of devices used in this work shall conform to details shown in the Plans and/or Exhibits or those indicated in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

III. EXECUTION

For this project, a Traffic Control Plan (TCP) has not been established. Contractor will be required to prepare his own TCP and as necessary in coordination with local TxDOT office.

If Contractor's plan is approved by the Engineer, it may be used. Prior to beginning work, the Contractor shall designate in writing a competent person who will be responsible and available on the project site or in the immediate area to insure compliance with the TCP.

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ITEM 1541

TRENCH SAFETY SYSTEMS

I. GENERAL

- A. Description: The Contractor shall comply with the minimum requirements of this specification. Maintenance and inspection of any shoring and related equipment shall be the responsibility of the Contractor. Owner and/or Engineer reserves the right to require the Contractor to remove, repair and/or replace any portions of the shoring system deemed unsafe but the final responsibility for worker's safety remains with the Contractor.

The Contractor shall determine the safety system needed for the project within the minimum requirements of this specification. For any trench excavation in materials other than solid rock, greater than 5 feet in depth, or where shown on the Plans and/or Exhibits, the Contractor shall provide a trench safety system. The trench safety system shall be in accordance with the appropriate requirements established in the Occupational Safety and Health Administration (OSHA), Safety and Health Regulations, Part 1926, Sub-part P – “Excavations, Trenching and Shoring” (latest edition). The Contractor's responsibility shall be to provide a safe working place for his employees, and he agrees to hold harmless and defend the Owner and/or Engineer against any claim resulting from failure of the trench safety system or lack of one.

B. Definitions

1. Angle of Repose: The greatest angle above the horizontal plane at which a material will lie without sliding.
2. Bank: A mass of soil rising above a digging level.
3. Braces: The horizontal members of the shoring system whose ends bear against the uprights or stringers.
4. Excavation: Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures increase the depth-to-width relationship, an excavation may become a trench.
5. Hard Compact Soil: All earth materials not classified as running or

unstable.

6. Kickouts: Accidental release or failure of a shore or brace.
7. Sheet Pile: A pile, or sheeting, that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
8. Sides, Walls, Faces: The vertical or inclined earth surfaces formed as a result of excavation work.
9. Slope: The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
10. Stringers, Wales: The horizontal members of a shoring system whose sides bear against the uprights or earth.
11. Trench: A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15-feet.
12. Trench Jack: Screw or hydraulic type jacks used as cross bracing in a trench shoring system.
13. Trench Shield: A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls or a trench from the ground level to the trench bottom and which can be moved along as work progresses.
14. Unstable Soil: Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.
15. Uprights: The vertical members of a shoring system.

II. MATERIALS

- A. Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions as called for in the OSHA construction standards, Sub-part P, Table P-2. All materials which are found to be defective in any way shall be immediately removed from the job site.

It shall be the responsibility of the Contractor to regularly check all trench safety equipment for soundness and adequacy.

- B. Steel trench shields shall be constructed of steel plate sides, welded to a steel framework. All shields shall be constructed in order to provide protection equivalent to or greater than sheeting or shoring required for the trench. The Contractor shall provide proof of such before using any trench shield. Adjustable jacks may be used in order to adjust the shield to varying trench widths. An access ladder shall be provided at the midpoint. Pipe or flat steel runners or wheels shall be installed under the side walls for ease of movement of the shield during trenching operations. Substantial lifting eyes and/or rings shall be welded at proper points for moving of the shield. For adaptability to deep and shallow trenches, the shield may be made with top and bottom sections. When the sides of the trench extend above the top of the shield, a reinforced roof with hatches shall be provided. Forced ventilation shall be provided for fully-enclosed shields.
- C. All maintenance of the trench safety equipment shall be the sole responsibility of the Contractor.

III. EXECUTION

All Contractors shall provide a trench safety system for all trench excavations which exceed a depth of 5-feet. Trench Safety system shall conform to the Occupational Safety and Health Administration (OSHA) standards latest revision along with the following additions and revisions. The types of trench safety systems currently allowed include shoring, bracing, solid shoring, sloping of the ground, and trench shields. The Contractor may submit an alternative method of trench safety, but may not use such until he has submitted to the Owner written approval by a Registered Professional Engineer. Should the Contractor decide to slope the sides of the trench, he shall have the angle of repose of the soil determined by an approved independent soils testing lab. Soil core samples taken to a depth of at least the depth of the trench shall be taken a minimum of every 700-feet. A minimum of two copies of the results of the lab tests shall be provided to the Engineer. The cost of the tests shall be included in the unit price bid for the trench safety system.

- A. Each Contractor shall be responsible and liable for his own Trench Safety System, including self inspections, whether or not a project representative is present on the job site. The Contractor shall install additional safety equipment if requested to do so by the Engineer. The Engineer's decision shall be final. The cost of additional trench safety equipment required shall be the responsibility of the Contractor.
- B. Before beginning any excavation the Contractor shall make an inspection of the job site. He shall pay special attention to the type of soil or soils in which he will be working, any adjacent roads, highways, and railroads, and any previous

excavations which may affect the integrity of trench excavations. All underground installations shall be located, including utility lines, pipelines, etc., before any excavation begins.

The trench safety system shall be installed in a true horizontal position, be spaced vertically and shall be secured to prevent sliding, falling, or kickouts. The trench safety system shall be effective to the bottom of the excavation. All trenches shall be provided with an adequate means of exit at all times with spacings of 25-feet or less. These means of exit shall be anchored in place in order to aid in the event a quick exit is necessary. During trench excavation, the excavated material shall be placed a minimum of 2-feet away from the edge of the trench.

- C. The Contractor shall make an inspection of all trench excavations. He shall check for any evidence of cave-ins, slides, etc. If any change in soil conditions or failure of the trench is found, the Contractor shall remedy such. All water shall be diverted by suitable means to prevent the entrance of same into any excavation. No water shall be allowed to accumulate in any excavation and shall be removed as soon as possible.

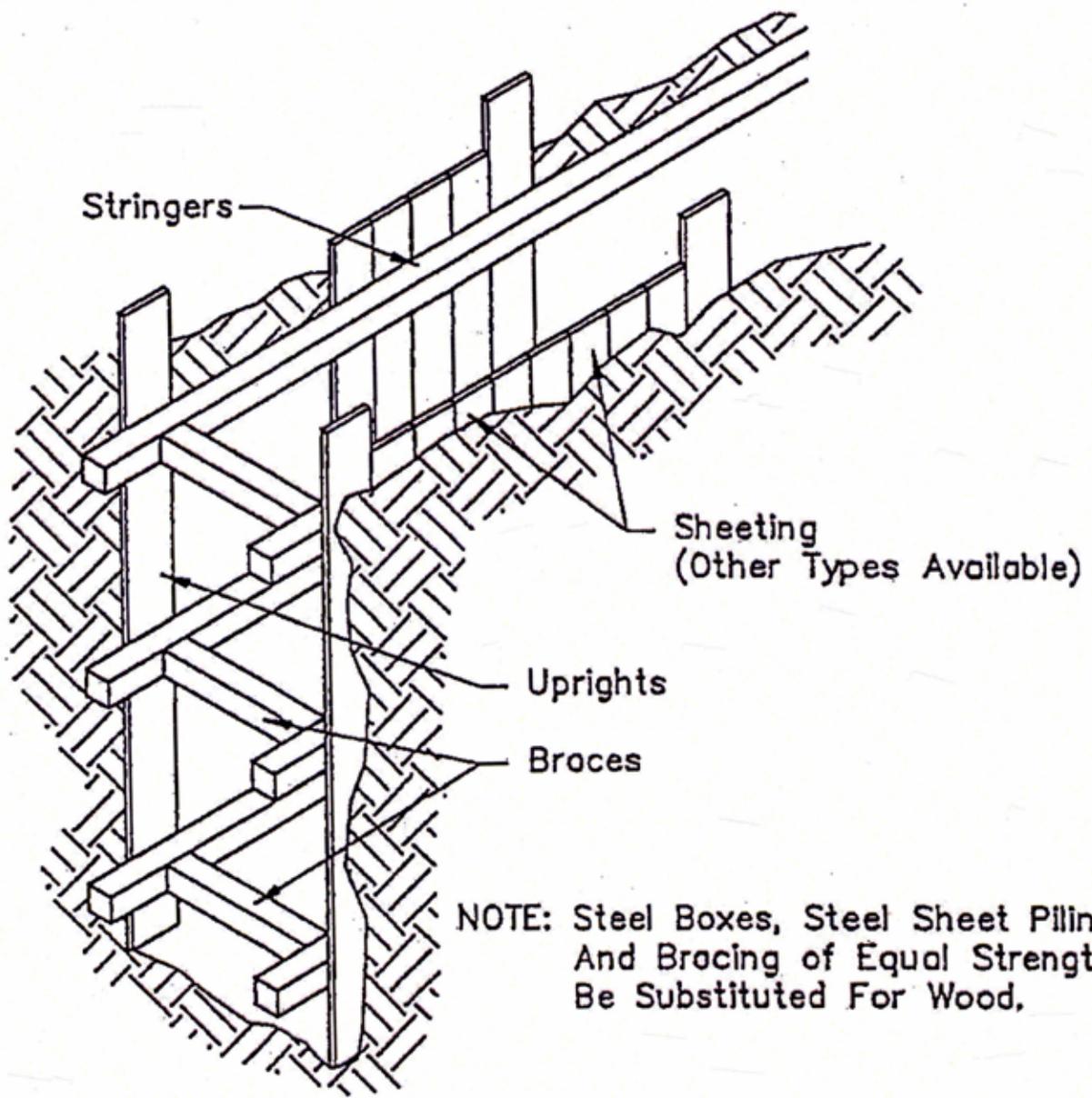
TABLE P-2
TRENCH SHORING - MINIMUM REQUIREMENTS

Depth of Trench	Kind of Condition of Earth	Size and Spacing of Members										
		Uprights		Stringers		Cross Braces: Width of Trench					Maximum Spacing	
		Minimum Dimension	Maximum Spacing	Minimum Dimension	Maximum Spacing	Up to 3 Feet	3 to 6 Feet	6 to 9 Feet	9 to 12 Feet	12 to 15 Feet	Vertical	Horizontal
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, Compact	3x4 or 2x6	6			2x6	4x4	4x6	6x6	6x8	4	6
	Likely-to-Crack	3x4 or 2x6	3	4x6	4	2x6	4x4	4x6	6x6	6x8	4	6
	Soft, Sandy, or Filled	3x4 or 2x6	Close Sheeting	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Hydrostatic Pressure	3x4 or 2x6	Close Sheeting	6x8	4	4x4	4x6	6x6	6x8	8x8	4	6
10 to 15	Hard	3x4 or 2x6	4	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Likely-to-Crack	3x4 or 2x6	2	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Soft, Sandy, or Filled	3x4 or 2x6	Close Sheeting	4x6	4	4x6	6x6	6x8	8x8	8x10	4	6
	Hydrostatic Pressure	3x6	Close Sheeting	8x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 to 20	All Kinds of Conditions	3x6	Close Sheeting	4x12	4	4x12	6x8	8x8	8x10	10x10	4	6
Over 20	All Kinds of Conditions	3x6	Close Sheeting	6x8	4	4x12	8x8	8x10	10x10	10x12	4	6

Trench jacks may be used in lieu of, or in combination with, cross braces.

Shoring is not required in solid rock, hard shale, or hard slag.

Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.



SHORING DETAIL
N.T.S.

ITEM 1563

CONTROL OF GROUND WATER AND SURFACE WATER

I. GENERAL

A. Section Includes

1. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.
2. Protecting work against surface runoff and rising flood waters.
3. Disposing of removed water.

B. References

1. ASTM D 698 – Standard Test Methods for Laboratory Compaction of Soils Using Standard Effort (12,400 ft-lb/ft³ (600kN-m/m³))
2. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
3. Federal Register 40 CFR (Vol. 55, No. 222) Part 122, EPA Administered Permit Programs (NPDES), Para.122.26(b)(14) Storm Water Discharge.

C. Definitions

1. Ground water control includes both dewatering and depressurization of water-bearing soil layers.
 - a. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts, and disposing of removed water. The intent of dewatering is to increase stability of tunnel excavations and excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure or heaving of the bottom of excavations; and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.

- b. Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom or instability of tunnel excavations.
 - 2. Excavation drainage includes keeping excavations free of surface and seepage water.
 - 3. Surface drainage includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the Work from any source of surface water.
 - 4. Equipment and instrumentation for monitoring and control of the ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.
- D. Performance Requirements
- 1. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.
 - 2. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Section 1541 - Trench Safety Systems, to produce the following results:
 - a. Effectively reduce the hydrostatic pressure affecting:
 - 1. Excavations
 - 2. Tunnel excavation, face stability or seepage into tunnels.
 - b. Develop a substantially dry and stable subgrade for subsequent construction operations.
 - c. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
 - d. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
 - e. Maintain stability of sides and bottom of excavations.
 - 3. Provide ground water control systems may include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.

4. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.
5. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.
6. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
7. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.
8. Provide an adequate number of piezometers installed at the proper locations and depths as required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.
9. Provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.
10. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

E. Environmental Requirements

1. Comply with requirements of agencies having jurisdiction.
2. Comply with the Texas Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
3. Obtain permit from EPA under the National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites.

4. Obtain all necessary permits from agencies with control over the use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.
5. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

II. PRODUCTS

A. Equipment and Materials

1. Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review of the Engineer through submittals required.
2. Eductors, well points, or deep wells, where used, must be furnished, installed and operated by an experienced contractor regularly engaged in ground water control system design, installation, and operation.
3. All equipment must be in good repair and operating order.
4. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

III. EXECUTION

A. Ground Water Control

1. Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine the draw down characteristics of the water bearing layers. The results shall be presented in the Ground Water and Surface Water Control Plan.
2. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.
3. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify Engineer

in writing of any changes made to accommodate field conditions and changes to the Work. Provide revised drawings and calculations with such notification.

4. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
5. Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.
6. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed works. Allowable piezometric elevations shall be defined in the Ground Water and Surface Water Control Plan.
7. Remove ground water control installations.
 - a. Remove pumping system components and piping when ground water control is no longer required.
 - b. Remove piezometers, including piezometers installed during the design phase investigations and left for Contractor's use, upon completion of testing, in accordance with applicable specifications.
 - c. Remove monitoring wells when directed by the Engineer.
 - d. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.
8. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hour after placement.
9. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.
10. Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such

as for units designed to withstand hydrostatic uplift pressure. Provide a means of draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.

11. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.
12. Compact backfill to not less than 95 percent of the maximum dry density in accordance with ASTM D 698.
13. Foundation Slab: Maintain saturation line at least 3 feet below lowest elevations where concrete is to be placed. Drain foundations in areas where concrete is to be placed before placing reinforcing steel. Keep free from water for 3 days after concrete is placed.

B. Requirements for Eductor, Well Points, or Deep Wells

1. For aboveground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.
2. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are predrained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.
3. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.
4. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is predrained by an existing system such that the criteria of the ground water control plan are satisfied.
5. Replace installations that produce noticeable amounts of sediments after development.
6. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control plan does not provide satisfactory results based on the performance criteria defined by the plan and by the specification.

C. Excavation Drainage

Contractor may use excavation drainage methods if necessary to achieve well drained conditions. The excavation drainage may consist of a layer of crushed stone and filter fabric, and sump pumping in combination with sufficient wells for ground water control to maintain stable excavation and backfill conditions.

D. Maintenance and Observation

1. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area or seepage into tunnel is occurring. Keep system in good condition.
2. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
3. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.
4. Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the Engineer.

E. Monitoring and Recording

1. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved and twice weekly thereafter.
2. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when Engineer determines that more frequent monitoring and recording are required. Comply with Engineer's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

F. Surface Water Control

1. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. The requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

2. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by such agencies.

IV. QUALITY CONTROL

A. Submittals

1. Submit a Ground Water and Surface Water Control Plan for review by the Engineer prior to start of any field work. The Plan shall be signed by a Professional Engineer registered in the State of Texas. Submit a plan to include the following:
 - a. Results of subsurface investigation and description of the extent and characteristics of water bearing layers subject to ground water control.
 - b. Names of equipment suppliers and installation subcontractors.
 - c. A description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria, and operation and maintenance procedures.
 - d. A description of proposed monitoring and control system indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.
 - e. A description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.
 - f. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
 - g. Operating requirements, including piezometric control elevations for dewatering and depressurization.
 - h. Excavation drainage methods including typical drainage layers, sump pump application and other necessary means.
 - i. Surface water control and drainage installations.
 - j. Proposed methods and locations for disposing of removed water.

2. Submit the following records upon completed initial installation:
 - a. Installation and development reports for well points, eductors, and deep wells.
 - b. Installation reports and baseline readings for piezometers and monitoring wells.
 - c. Baseline analytical test data of water from monitoring wells.
 - d. Initial flow rates.
3. Submit the following records on a weekly basis during operations:
 - a. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization.
 - b. Maintenance records for ground water control installations, piezometers, and monitoring wells.
4. Submit the following records at end of work. Decommissioning (abandonment) reports for monitoring wells and piezometers installed by other during the design phase and left for Contractor's monitoring and use.

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ITEM 1578

TRAFFIC PAINT STRIPING

I. GENERAL

A. Description

This Item shall govern for the installation of reflectorized traffic paint striping on pavement, where the color and width of line shall be as specified on the Plans and/or Exhibits.

B. Related Work (if utilized in this project)

1. Item 1533 - Barricades, Signs, and Traffic Handling - No TCP
2. Item 1582 - Traffic Paint

II. EXECUTION

A. Description

The Contractor shall use a crew experienced in the work of installing paint striping and the necessary traffic control for such operations on the roadway surface and shall supply all of the equipment, personnel, traffic control and materials necessary for the placement of paint striping as shown on the Plans and/or Exhibits or as directed by the Engineer. All work shall be in accordance with the latest edition of the Texas State Department of Highways and Public Transportation's "Manual on Uniform Traffic Control Devices."

The pavement surface to receive the striping shall be thoroughly cleaned of all dirt, organic growth, or other material that will prevent adhesion of the paint to the roadway surface.

The striping shall be placed in the proper alignment with guides established on the roadway. Deviation from the alignment established shall not exceed two inches and, in addition, the deviation in alignment of the markings being placed shall not exceed one inch per 200-feet of roadway, nor shall the deviation be abrupt.

When deemed necessary by the Engineer, the Contractor, at his expense shall place any additional pilot markings required to facilitate the placement of the permanent markings in the alignment specified. Any and all additional markings

placed on the roadway for alignment purposes shall be temporary in nature and shall not establish a permanent marking on the roadway.

Materials used for pilot markings and equipment used to place such markings shall be approved by the Engineer. Paint shall be applied at a rate which will yield a wet film thickness of 15 to 20 mils.

Glass reflective spheres for traffic paint shall be applied in accordance with the item, Item 1581 - Glass Reflective Spheres for Traffic Paint. Under no circumstances shall the bead application rate be less than 7½ pounds of beads per gallon of paint applied to the road surface.

Applied markings shall be protected from traffic until they have dried sufficiently so as not to be damaged or tracked by normal traffic movement.

B. Equipment

Paint striping equipment used to place four-inch solid or broken lines shall have a capability of an average hourly placement rate of 7,000 linear feet in any five consecutive working days of seven hours or more. The equipment shall be capable of applying one 4-inch broken line and either one or two solid lines simultaneously.

The equipment shall be equipped with an automatic cut-off device (with manual operating capabilities) to provide clean square marking ends and to provide a method of applying a broken line in a stripe to gap ratio of 15 to 25. The equipment shall be capable of placing lines of all widths with clean edges and of uniform cross-section. Four-inch lines shall be 4-inch plus or minus c-inch. Eight-inch lines shall be 8-inches minimum and 8¼-inches maximum in width.

When necessary, the equipment shall be equipped so with bead dispensers, one for each paint spray gun, placed on the equipment so that beads are applied to the paint almost instantly as the marking is being placed on the roadway surface. The bead dispensers shall be designed and aligned so that beads are applied uniformly to the entire surface of the marking. The bead dispensers shall be equipped with automatic cut-off controls, synchronized with the cut-off of the marking equipment.

Paint pots or tanks shall be equipped with an agitator that will keep the paint thoroughly mixed and may be either a pressurized or non-pressurized type.

C. Removal

When construction operations require the alternation of any pavement marking, the contractor shall provide for the covering or complete obliteration of any markings to the satisfaction of the Engineer. Removal of the markings shall leave no discernible evidence of the marking having ever been in place. No direct payment shall be made for marking removal.

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ITEM 1582

TRAFFIC PAINT

I. GENERAL

A. Description

This Item shall govern for the materials composition, manufacture and testing of all traffic paint and related materials as covered herein.

B. Intent

The coating design specified has been stipulated by means of carefully controlled formulations durability testing methods. The intent of the Engineer is to procure coatings which are identical in all essential respects to the standards of the State Department of Highways and Public Transportation; hereafter referred to as "Standards."

Specifications, codes, accepted practices, etc., not specifically listed in these specifications are not applicable.

When required, the paint manufacturer shall supply Labor Form LSB-OOOS-4, "Material Safety Data Sheet."

C. Conformance of Finished Products

Coatings shall conform, on a weight basis, to the composition requirements of the standard formula. No variation from the standard formula will be permitted except for replace of volatiles lost in processing, or those approved by the Engineer. The finished coatings shall conform with all requirements stipulated for each standard formula, and, in addition, shall equal a Wet Standard in characteristics such as color, drying, flow, settling, brush ability, can stability, hiding, etc.

Film characteristics such as floss, hardness, light permanency, adhesion, etc., shall also conform. When testing for such conformity, the coating shall be applied and tested under parallel conditions with the Wet Standard.

The finished product shall be free of skins and foreign materials.

D. Inspection, Sampling and Testing

All products required to meet these specifications shall be inspection and tested at the discretion of the Engineer.

E. Related Work (if utilized in this project)

1. Item 1578 - Traffic Paint Striping
2. Item 1581 - Glass Reflective Spheres For Traffic Paint

II. MATERIALS

A. Raw Materials

The exact brands and types of raw materials used in the Wet Standard are listed for the purpose of facilitating the selection of parallel material equal not only in quality and composition but also in physical and chemical behavior after being used in the finished product. Since evaluation of paint containing questionable materials may require sixty days and since meeting delivery schedules is a responsibility of the paint manufacturer, he is reminded that he should schedule material procurement and paint production to permit him to meet delivery commitments. The final decision as to the equality of materials shall be made by the Engineer. After the Engineer has agreed to the brand names of raw materials proposed by the Contractor, no substitutions will be allowed during the manufacture prior agreement with the Engineer.

“The Contractor should be aware that it is his responsibility to select raw materials that not only meet the individual raw material specifications but will also produce coating conforming to the specific formula requirements.”

1. Materials of Foreign Origin: Because of the limited information available on materials manufactured outside the continental limits of the United States, the manufacturer is advised to review paragraphs 691.5 and 691.8 of the specifications when considering the use of materials of foreign origin.
2. Materials Required to Meet Federal And ASTM Specifications: All materials required to meet Federal or ASTM specifications must conform to the specifications as shown. Specifications or Amendments of other dates will not supersede.
3. Pigments

- a. White
 - 1) Pure Titanium Dioxide, Rutile, Non-Chalking, shall meet ASTM Specifications D-476, Type II.
 - 2) Lead free zinc Oxide shall meet ASTM Specification D-79 either American process or French Process.

b. Colored: Titanium Dioxide, Special, Tutile, Non-Chalking:

Specific Gravity	4.1 + 0.05
Oil Absorption	18 + 10% Moisture 0.5% max.
Retained on #325 Mesh	0.1% max.
TiO ₂	95% min.
Fe ₂ O ₃	2.0 - 3.0%
PH	6.5 - 7.0
Ignition Loss	0.34% max.
Y (luminosity)	42.5 - 45.5

c. Medium Chrome Yellow

Color and Color Characteristics. The luminance factor of the pigment shall be within the limits listed below when tested before and after exposure.

	Min.	Max.
Initial	53	59.0
Final	45	

In addition, the allowable change between the initial and final luminance factors shall be not more than 9 units.

The initial X, & chromaticity color coordinates of the pigment shall be within the rectangle defined by the sets of coordinates shown below:

<u>X</u>	<u>Y</u>
0.490	0.455
0.511	0.433
0.514	0.480
0.535	0.458

Method of Test: The pigment shall be tested according to Test Method Tex-810-B. (State Department of Highways & Transportation).

Color Standard: National Bureau of Standards, Chromatic Standard No. SCH-30.

The formula of the test enamel using the pigment to be tested is as follows:

<u>Material</u>	<u>Parts by Weight</u>
Color Pigment	54.0
Long Oil Alkyd Resin (1)	31.5
4% Calcium Drier	0.6
6% Cobalt Drier	0.3
Anti-Livering Agent	0.1
Anti-Skinning Agent	0.2
Mineral Spirits (2)	13.3 (3)

- 1) Alkyd Resin Solution meeting Federal Specification TT-T-266D, Type 1, Class A, November 17, 1971.
- 2) Mineral Spirits meeting ASTM D-235, Type IV.
- 3) The amount of Mineral Spirits may be varied slightly to produce the desired grinding consistency.

Number of coats: Two

d. Inert

- 1) Talc, Paint-Grade Magnesium Silicate shall meet ASTM Specification D-605-69 (Reapproved 1976).
- 2) Calcium Carbonate

CaCO ₃	Min. 97.0%
H ₂ O	Max. 0.4%
Specific Gravity	2.63 - 2.73
Weight Retained on #325 Screen	Max. 0.75%

Color: Equal to material listed in Standard Formula. Substitution in a Standard Formula shall not result in a viscosity variation greater than 4 KU.

- 3) Calcined Kaolin (Aluminum Silicate Anhydrous)

Min. %	Max. %
---------------	---------------

Al ₂ O ₃	39.6	44.0
SiO ₂	51.0	56.5
Fe ₂ O ₃		1.0
TiO ₂		2.5
CAO + M _g		0.8
Na ₂ O + K ₂ O		1.2
Ignition Loss		1.0

In addition, the X-ray diffraction pattern shall match the X-ray diffraction pattern specified by the State Department of Highways and Public Transportation.

Materials having color requirements shall be tested according to Test Method Tex- 810-B. (State Department of Highways and Public Transportation).

4. Resins

- a. Chlorinated Paraffin: Shall meet Federal Specification MIL-C-429C, type I.
- b. Chlorinated Rubber: Shall be similar and equal to the standard sample submitted to an independent licensed testing laboratory by the manufacturer and approved by the County prior to the award of contract for coatings in which the material is proposed for use.

Viscosity @ 25°C (20% solution with Toluol) * 17 - 22 cups.

*Toluol shall meet ASTM Specification D-362.

Substitution in a Standard Formula shall not result in a viscosity variation greater than 4 KU.

c. Traffic Paint Alkyd Resin solution

1) General

Type: Pure, drying alkyd
Length: Medium
Type Oil: Soya, linseed or tall. No mixture of two or more oils will be permitted.
Solvent: Toluol, ASTM Specification D-362.
Compatibility: A solution of one part 75% traffic alkyd and five parts toluol shall be clear.

A solution containing the equivalent of 120 grams of 20 cps chlorinated rubber 130 grams of 75% traffic alkyd, 200 grams of methyl ethyl ketone shall be clear, transparent, and show no separation after 24 hours of storage in a ¾ full test tube at 80° + 5° F. This rubber-alkyd- solvent solution shall produce a clear film upon drying.

2)	Percent Phthalic Anhydrides	33 to 37
	Percent Oil Acids	48 to 55
	Acid Number, Max.	8.0
	Ash Residue, Max.	0.10%
	Iodine Number of Fatty Acids, Min.	115
	Refractive Index of Fatty Acids, Min.	1.4660
	Percent Resin based on Fatty Acids (Tall Oil Alkyds), Max.	1.0

3) 45% Solids Basis *

Color: Gardner 1953 Standard - 9 max. Drying time: A wet film 3 mils thick shall set to touch in not more than 90 minutes.

Driers: Based on the resin solids present, add the equivalent of 0.06% Cobalt (metal) and 1.0% Lead (metal).

*Toluol shall be used to reduce the resin solution of 45% solids, and shall meet ASTM Specifications D-362.

- 4) Turbidity: In addition to the above requirements, the Traffic Alkyd Resin shall meet the following % Transmittance requirements when tested according to Test Method Tex-814-B, utilizing methyl isobutyl ketone as primary solvent, and methyl alcohol as precipitating agent.

% Transmittance	<u>Min.</u>	<u>Max.</u>
T ₁	10.0%	
T ₂		70.0%

Calculate volume in milliliters of precipitating agent as follows:

$$V_1 = 91x$$

where: V₁ = volume of precipitating agent required for T₁

x = grams of alkyd resin solids

and $V_2 = 1.398V_1$

where: V₂ = additional volume of precipitating agent required for T₂

5. Thinners

a. Methyl Ethyl Ketone: Shall meet ASTM D-740

b. Aromatic Naphtha

1) Appearance: Clear, free of sediment

2) Color: Water white

3) Boiling Range: 360° F - 415° F

4) Kauri Butanol Value: 88 minimum

5) Specific Gravity, (25° C): 0.884-0.894

6) Flash Point °F (TTC) 140 minimum

6. Additives and Chemicals

- a. Driers: Shall pass ASTM D600
- b. Additives listed below must be similar and equal to the standard sample submitted to an independent licensed testing laboratory by the manufacturer and approved by the County Engineer prior to the award of contract for coatings in which the additive is proposed for use:
 - 1) Stabilizer
 - a) Class A - Thermolite 813, M&T Chemicals, Inc.
 - b) Class B - Stanclere T-55, Interstab Chemicals, Inc.
 - 2) Treated Bentonite Clay
 - a) Bentone 34, NL Industries;
 - b) Claytone 40, Southern Clay Products;
 - c) Tixoget VP, United Catalyst, Inc.

7. Formula

a. WPT - 8f White Paint, Traffic	Pounds
Traffic Alkyd, 75% solids (Tuluol)	130
Chlorinated Rubber, 20 cps, Hercules, Parlon S-20	120
Chlorinated Paraffin, Type 1, Hercules, Chlorafin 40	75
Titanium Dioxide, Rutile, DuPont, R-900	150
Lead Free zinc Oxide, ASARCO, AXOO33	50
Talc, WC&D 4404	225
Calcium Carbonate, Pure Stone Micro Fill #1	225
Treated Bentonite Clay	5
Stabilizer, Class A	0.4

Stabilizer, Class B	0.4
24% Lead Drier	3
6% Cobalt Drier	2
Aromatic Naphtha, SC-150	5
Methyl Ethyl Ketone	<u>280</u>
	1270.80

Grind: 4 minimum, Particles: 8 maximum
(Test Method Tex-806-B)

Gallon Weight: ± 0.05 of theoretical gallon weight

Consistency: 83 to 97 KU

Skinning: No skinning within 48 hours (Test Method Tex-811-B)

b.	<u>YPT-8f Yellow Paint, Traffic</u>	<u>Pounds</u>
	Traffic Alkyd, 75% Solids (Toluol)	130
	Chlorinated Rubber, 20 cps, 1C1 Alloperene X-20	120
	Chlorinated Paraffin, Type 1, 1C1 Cereclor 42	75
	Titanium Dioxide Special, Rutile, Benilite Corp, Hitox	35
	Lead Free Zinc Oxide, ASARCO, AXO-33	50
	Medium Chrome Yellow, DuPont, Y-469-D	125
	Calcium Carbonate, Pure Stone Micro Fill #1	225
	Talc, WC&D 4404	225
	Treated Bentonite Clay	5
	Stabilizer, Class A	0.4
	Stabilizer, Class B	0.4

24% Lead Drier	3
6% Cobalt Drier	2
Aromatic Naphtha, SC-150	5
Methyl Ethyl Ketone	<u>285</u>
	1285.80

Grind: 4 minimum, Particles: 8 maximum (Test Method Tex-806-B)

Gallon Weight: ±0.05 lbs. of theoretical gallon weight

Consistency: 83 to 97 KU

Skimming: No skinning within 48 hours (Test Method Tex-811-B)

III. EXECUTION

A. Construction Methods

All traffic paint applications shall meet the following requirements:

1. Traffic paint shall be applied at the rate of one gallon of unthinned paint per 105 square feet of surface area.
2. Traffic paint shall be applied with a minimum thickness of 15 mils, measured in a wet condition.
3. Paint striping shall be applied and measured to ± ¼-inch of the specified widths.

All traffic paint striping not meeting these requirements shall be “touched up” and/or completely restriped to these standards and in accordance with the Plans and/or Exhibits at no additional cost.

Where traffic buttons exist, the paint shall be applied to the pavement adjacent to, but not on the buttons or markers, unless another method is specified.

Word and symbol markings on pavement shall be in accordance with “Pavement Work and Symbol Markings” Section of the latest Texas Manual on Uniform

Traffic Control Devices of the State Department of Highways and Public Transportation.

B. Testing

When required, the Contractor shall pay for and provide to the Engineer, a testing report performed by a local testing laboratory designated by the Engineer. The report shall verify that the raw and finished materials to be supplied under this contract meet the requirements of this specification.

Rejection, materials and finished products which fail to meet any or all requirements of these specifications shall be subject to rejection. All materials and finished products rejected by the Engineer, whether in containers or applied to roadway surface shall be removed from the jobsite and replaced with materials meeting specifications and requirements and all costs of such removal and replacement shall be borne by the Contractor.

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ITEM 2102

CLEARING AND GRUBBING

I. GENERAL

- A. Scope: Clearing and grubbing consists of removal and disposal of trees, stumps, brush, roots, vegetation, logs, rubbish, and other objectionable matter along the construction route within utility easements, access road easements right-of-way, and where designation within the boundaries of the plant site.
- B. Measurement and Payment
 - 1. No Separate Payment. Include cost of work in contract bid prices.
 - 2. The Contractor shall not remove trees 6-inches in diameter or larger, unless said tree has been marked for removal.
- C. Notification to Engineer: The Contractor will notify the Engineer at least three days before any clearing is begun so that all trees to be removed can be marked.
- D. Related Work (if utilized in this project)
 - 1. Item 2227 - Waste Material Disposal

II. MATERIALS

The Contractor shall use equipment and materials necessary to properly complete clearing and grubbing.

III. EXECUTION

- A. Clearing: Remove all stumps, brush, vegetation, logs, rubbish, and other objectionable matter from designated areas. Trees to be saved shall be marked prior to execution of this Item.
- B. Grubbing: Remove stumps and roots within pavement and foundation sections to depth of 2-feet below finish subgrade elevation. For areas outside pavement and foundation sections, remove stumps and roots to depth of 2 feet below finished surface of required cross sections.

- C. Preservation: Protect trees unless designated for removal and those on adjacent property.
- D. Removing Material: Unless otherwise specified, cleared and grubbed material becomes property of the Contractor, to be removed from the work site or disposed of in manner not to damage the Owner. Burning of cleared and grubbed material is not permitted.

ITEM 2107

TURF ESTABLISHMENT

I. GENERAL

This Item specifies requirements for preparation of the seedbed and planting of turfgrass.

II. MATERIALS

A. Seedbed (Top Soil): Topsoil may be from on-site or imported. All topsoil shall be easily cultivated, relatively free from objectionable material including, gravel, large roots, stumps, wood, brush, debris, hard clods, clay balls, hardpan, refuse or other deleterious materials, and be of reasonably uniform quality.

1. In the case of on-site or nearby source, topsoil is the surface layer of material containing decaying vegetable matter and roots. It is not necessary to strip all soil containing fine hair like roots, only soil containing moderate to heavy root mat.
2. Imported topsoil shall satisfy the following property values:

	<u>TEST PROPERTY</u>	<u>TEST METHOD</u>	<u>UNIT</u>	<u>VALUE</u>	
a.	Soil Reaction	ASTM D4972	pH	6-8	(a)
b.	Passing No. 4 Sieve	ASTM D422	%	95-100	(b)
c.	Sand Size, 2.0-0.05 mm	ASTM D422	%	10-70	(b)
d.	Silt Size, 0.05-0.005 mm	ASTM D422	%	0-40	(b)
e.	Clay Size, <0.005 mm	ASTM D422	%	20-50	(b)
f.	Easily Oxidizable Organic Matter	AASHTO T194	%	2.5-10	(b&c)

NOTES:

- a) Determine pH by Method A, pH meter. In the event that the imported topsoil does not satisfy the specified pH range, Contractor shall achieve the desired pH by applying soil amendments as recommended by the certified agronomist's report of soil sample analysis.
- b) Dry weight of sample.

- c) Soil testing company shall identify test method used if different than listed.
- d) Soil tests will be paid for by Owner.

B. Seed: Seed shall be applied in accordance with the following:

SEED PLAN	PLANTING DATES	PLANT SPECIES	PLS RATE (pounds/acre)
1	October 1 to March 31	*"KY-31" Tall Fescue Hulled Common Bermuda grass *"Gulf" Annual Ryegrass Crimson Clover & Inoculant	15 50 15 20
2	April 1 to Sept. 30	*Foxtail Millet Hulled Common Bermuda grass	15 60
3	April 1 to Sept. 30	*Foxtail Millet Hulled Common Bermuda grass "Pensacola" Bahia grass	15 60 15
4	As directed	Hulled Common Bermuda grass	50
5	As directed	Crimson Clover & Inoculant	20

* - Indicates **MAXIMUM APPLICATION RATE ALLOWED.**

NOTES:

- a) All planting dates are approximate. Engineer shall determine Seed Plan prior to the start of seeding.
- b) Seed Plan 1 shall be used when the average maximum daylight air temperature for the preceding two calendar weeks is less than 75 degrees F.
- c) Seeding rate is for "Pure Live Seed (PLS)." Percentage of purity, germination, and dormant seeds, as shown on the seed tag, shall be used to determine actual application rate of bulk material to obtain required amount of PLS per acre.

Pure Live Seed (PLS) = (% Germination + % Dormant seed) x % Purity.
- d) Seed Plans 4 and 5 shall be used **only** as directed by the Engineer.

C. Sod

1. Sod shall consist of live, growing Bermudagrass or "Raleigh" St. Augustine grass, as required by the Engineer.
2. Sod shall be dark green and have a healthy vigorous system of dense, thickly matted roots throughout the soil of the sod for a minimum depth of 1-inch (\pm ¼ inch), excluding top growth and thatch.
3. Sod shall contain no more than 5% noxious weeds and other crop and weed contaminants. Sod shall be free of diseases and harmful insects.
4. Sod shall be cut in uniform panels. Broken panels or panels with torn or uneven ends will not be accepted.
5. Sod panels shall be strong enough to support their own weight and retain size and shape when suspended vertically from a firm grasp on the upper 10% of the panel.
6. Sod shall be harvested, delivered, and installed within a 36 hour period. Sod not planted within this time period shall be inspected and approved by the Engineer prior to installation.
7. Sod which has been allowed to dry out by exposure to the sun and air is unacceptable and shall be rejected.

D. Fertilizer

1. Fertilizer shall be a commercial type conforming to the fertilizer laws in effect as regulated by the Texas Department of Agriculture. A pelleted or granulated fertilizer shall be used which has the specified analysis. The guaranteed analysis represents the percent nitrogen (total N), percent water insoluble nitrogen (where applicable), percent phosphate (citrate soluble P as P₂O₅), and percent potash (water soluble K and K₂O) nutrients as determined by the methods of the Association of Official Analytical Chemists.
2. Contractor shall use a complete fertilizer with an analysis ratio of 3:1:2 (N:P:K), such as 15:5:10, or as directed by the Engineer.
3. Fertilizer shall be applied at a rate of 60 pounds N/acre, which is 400 pounds/acre of 15:5:10.
4. Fertilizer shall be delivered in bags or containers clearly labeled with name and address of the manufacturer, weight, and guaranteed analysis.

Bulk fertilizer shall be acceptable if accompanied by an invoice or label with the name and address of the manufacturer and guaranteed analysis and appropriate means to accurately measure and record weight of fertilizer used.

5. Fertilizer shall be in clean, unopened, and undamaged bags.
6. Fertilizer shall not contain objectionable material which may hinder proper distribution.
7. Fertilizer shall be dry and free-flowing. Caked fertilizer will be rejected.

III. EXECUTION

A. General

1. Turf establishment shall be performed as soon as practical after construction activities, but not later than 21 calendar days. Long term exposure of bare earth will not be permitted. Engineer may stop work on portions, or all, of the project until exposed areas receive the designated turf establishment.
2. Work shall not be performed on areas that are so wet that equipment operation causes tracking and compaction of the ground, or when the soil is in a non-tillable condition.

B. Seedbed

1. Seedbed Installation, Imported
 - a. Imported Topsoil: Engineer may direct the Contractor to import topsoil if on-site seedbed is of insufficient quantity or quality.
 - b. Topsoil Delivery, Storage and Handling: Topsoil shall be delivered, stockpiled and handled in such a way as to not contaminate the material with other soils or objectionable materials.
 - c. Topsoil Excavation (On-Site): Contractor shall strip topsoil specified on the Plans and/or Exhibits or as directed by the Engineer from areas to be excavated or filled and stockpile it for use on the final designated area.

- d. Topsoil Placement
 - 1) Prior to placing topsoil, scarify the subgrade to a minimum depth of 4-inches until it is loose and uncompacted to provide bonding of topsoil layer to subgrade.
 - 2) Top elevation of topsoil shall be placed at the design finish grade elevation shown on the Plans and/or Exhibits.
 - 3) Topsoil shall not be spread when excessively wet or dry.
- e. Disposal: Contractor shall dispose of excess topsoil only after approval by the Engineer and in accordance with Item 2227 - Waste Material Disposal.

2. Seedbed Preparation, On Site

- a. Seedbed is defined as the soil designated to support turf grass and/or sod, approximately 6-inches in depth below the design surface.
- b. Irregularities in finished seedbed surfaces shall be corrected to eliminate depressions.
- c. Disc, harrow, rake and grade the seedbed until it is free of clods and roots.
- d. Roots and woody plants over 1-inch diameter shall be removed.
- e. Final surface shall be left in a roughened condition. Imprints from the equipment shall be left horizontally on the slope.
- f. Surface crusting of the seedbed after rainfall or compaction, but prior to turf establishment, shall be broken up by disking, harrowing, or raking.
- g. For areas receiving sod, grade the seedbed adjacent to existing turf, pavement, etc., to permit sod to be flush with adjacent surfaces.
- h. Prepared seedbeds shall be protected from damage by pedestrian or vehicular traffic.
- i. Prepared seedbeds shall be inspected and accepted by the Engineer prior to turf establishment.

C. Seeding Methods: Method of planting shall be as noted on the Bid Sheets or Plans and/or Exhibits, or as directed by the Engineer.

1. Dry Application

a. Fertilizer shall be spread evenly and uniformly and incorporated (disked, raked, or harrowed) into the seedbed prior to seeding.

b. Seeding

1) Plant seed with a broadcast seeder or a culti-packer seeder. Grass seed shall be planted no deeper than ¼-inch, and the distance between rows shall be 12-inches or less. Distribute seed uniformly.

2) Roll the planted seedbed with a culti-packer or rake immediately after seeding and prior to applying mulch cover.

3) Seed may be broadcast by hand for small areas or areas inaccessible to seeding equipment, as approved by the Engineer. Areas seeded by hand shall be rolled or lightly compacted, if possible.

c. Mulching

1) Immediately after application of seed, straw or hay mulch shall be applied to all seeded areas with a slope steeper than 6H:1V (Horizontal:Vertical).

2) Straw or hay mulch shall be applied at a rate of 2,500 pounds (dry weight) per acre.

3) The straw or hay mulch must be secured with hydromulch or other approved methods.

a) Hydromulch, consisting of an homogeneous aqueous mixture of recycled paper fiber, water, and tackifier, shall be applied to achieve a rate of 1,000 pounds of paper fiber mulch per acre over the straw mulch. Guar gum tackifier shall be applied at a minimum rate of 50 pounds (dry weight) per acre.

b) Application rate for other tackifier/soil binder compounds shall be in accordance with

manufacturer recommendations and approved by the Engineer.

- d. Watering: After mulching, water the seedbed until the surface is uniformly moist to an approximate depth of ½-inch. Excessive watering pressure or quantity which would cause washing of mulch and seed, erosion, or rilling shall not be allowed.

2. Hydroseeding With Mulch

- a. Hydroseeding with mulch is the application of an homogeneous aqueous mixture of seed, water, fertilizer, dye, wood fiber mulch, and tackifier/soil binder to the seedbed.
- b. Fertilizer shall be added to the aqueous mixture no more than 30 minutes prior to application to prevent damage to the seed. Fertilizer shall be completely water soluble.
- c. Guar gum tackifier shall be applied at a minimum rate of 50 pounds (dry weight) per acre.
- d. Wood fiber mulch shall be applied at a rate of 2,000 pounds (dry weight) per acre.
- e. Application rate for other tackifier/soil binder compounds shall be in accordance with manufacturer's recommendations and approved by the Engineer.

3. Overseeding

- a. Overseeding is the application of an homogeneous aqueous mixture containing water, seed (per Seed Plan 4 or 5), and fertilizer to an area with existing vegetation.
- b. At the direction of the Engineer, site shall be mowed prior to overseeding.
- c. Soil surface shall be lightly disked no more than 1-inch deep.
- d. Fertilizer shall be added to the aqueous mixture no more than 30 minutes prior to application to prevent damage to the seed. Fertilizer shall be completely water soluble.
- e. Area shall be rolled with a culti-packer, or lightly harrowed or raked to cover seed with a ¼-inch of soil.

D. Sodding

1. Sod shall be placed in areas as shown on the Plans and/or Exhibits or as directed by the Engineer.
2. Fertilizer shall be spread evenly and uniformly and incorporated (disked, raked, or harrowed) into the seedbed prior to placing sod.
3. Prepared seedbed shall be lightly watered immediately prior to placing sod, as required.
4. Sod panels shall be placed tightly against each other in rows.
5. Lateral joints shall be staggered. Care shall be exercised to ensure the sod is not stretched or overlapped and that all joints are butted tightly with no spaces between strips.
6. Tamp or roll the sod to ensure good contact with the seedbed.
7. Lightly water sod during installation to prevent excessive moisture loss.
8. Immediately after installation of sod, remove extraneous clumps of sod or soil on sod, rake and wash off plant remnants on sod or adjacent pavements.

IV. QUALITY ASSURANCE

- A. Engineer shall accept turf establishment when specified area is complete with an established growth on soil stabilized turf.
- B. Contractor shall be responsible for repairing areas damaged until the turf establishment is accepted by the Engineer. Repairs include, but not limited to, damage due to erosion, rilling, traffic, or other causes.
- C. Contractor shall replace all dead or dying sod panels.

ITEM 2210

SITE GRADING

I. GENERAL

Within limits indicated, or in areas where existing grade is to be altered, strip existing topsoil to 6-inch depth, and stockpile in approved areas for subsequent replacement. Remove and dispose of all vegetation, roots, and waste materials in an approved manner.

II. MATERIALS

- A. Site Fill: Use approved excess excavation or borrow material. Where necessary to borrow material, borrow from approved source, excavate, and clean up borrow area. Material stripped from borrow site not to be reused unless specifically designated on Plans and/or Exhibits.
- B. Select Fill: Select fill shall be lean clay to sandy, lean clay soil with a maximum liquid limit of 35 and a PI range of 8 to 20 and a minimum of 60 percent passing the No. 200 sieve. Select fill may consist of lime stabilized soils excavated on site. Lime stabilization of 8-inch loose lifts should be performed by blending 25 pounds of hydrated lime per square yard into each 8-inch loose lift of fill soils.

III. EXECUTION

- A. Surface Drainage: Maintain surface drainage on site during construction.
- B. Select Fill Under Structures and Roads: Place select fill in 8-inch maximum layers, measured loose, and compact at or near optimum moisture with tamping roller (sheepsfoot) pulled with crawler-mounted tractor to within ± 2 percent of optimum moisture content AASHTO Standard T-99-74 density. Fill to be placed to subgrade elevation without addition of topsoil. Where select fill to subgrade elevation is less than 6-inches, scarify to a depth of 6-inches and compact as specified before.

- C. Site Fill: Place approved fill to within 4-inches of finish grade shown on all areas not covered by structures or roads in 10-inch maximum layers, measured loose, and compact at or near optimum moisture to at least 90 percent ASTM D 698 density, at or within 3 percent of the optimum moisture content, unless otherwise shown on Plans and/or Exhibits.
- D. Topsoil: Place topsoil over all areas within limits shown on Plans and/or Exhibits. After construction has been substantially complete and site fill made, grade site 4-inches lower than finished grade on all unpaved areas, clear ground surface of all foreign materials, then place 4-inches of topsoil to bring site to smooth finished grade indicated.
- E. Waste: Waste stripped materials from within limits indicated. Spread waste material over designated area, dress by blading, and slope to provide drainage.
- F. Final Clean-Up: Level washes, ruts, depressions, and mounts to give areas smooth finish.

ITEM 2221

EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES

I. GENERAL

- A. Scope: This specification covers excavation and trenching work and shall include the necessary pavement removal and preparation of the site, removal and disposal of all debris, excavation, and trenching as required, handling, storage transportation, and disposal of all excavated material, all necessary sheeting, shoring, and protection work, preparation of sub-grades, pumping and dewatering as necessary or required, protection of adjacent property, backfilling, pipe embedment, pipe abandonment, backfill, maintenance, and other appurtenant work for the installation of underground utilities.
- B. Related Work (if utilized in this project)
1. Item 2555 – Water Piping
 2. Item 2560 – Sanitary Sewers
 3. Item 2600 – Repair of Asphalt Paving
 4. Item 15061 – Steel Piping and Fittings
 5. Item 15062 – Ductile Iron Pipe and Fittings
 6. Item 15064 – Plastic Piping and Fittings (4-Inches or Smaller)
- C. Existing Utilities: The Plans and/or Exhibits show the approximate location of all known underground utilities, foreign pipe lines and structures. No guarantee is made that all such obstructions have been found and located, unknown lines may be encountered. The trench shall be excavated well ahead of the pipe laying operations to expose underground utilities, foreign pipe lines and structures. The Contractor shall employ skilled operators and proceed with caution at all times. Upon encountering such an obstruction the Contractor shall immediately notify the Engineer and the Owner. If the encounter results in damage of the nature that may endanger the public, he shall take such emergency measures as appropriate to notify the affected public, and to mitigate the danger. If the obstruction conflicts with the proposed work, he shall stop work until directions are given by the Engineer. Avoid damage to utilities and foreign pipe lines throughout all operations.

- D. Pavement Protection: All tracked construction equipment shall have tracks fitted with suitable pads to minimize damage to pavement. Those not so fitted may be driven across pavement surfaces only when suitable planking or mats are interposed between track and pavement, or when pavement is protected by suitable layer of earth. All construction operations shall be conducted so to minimize damage to pavement other than that scheduled for removal. All such damage shall be repaired by the Contractor restoring damaged areas to as near original condition as practical.
- E. Blasting will not be permitted without specific written approval from the Engineer.

II. MATERIALS

- A. Earth Backfill (EF): Where no other backfill is specified, use suitable soils from the excavation as backfill material. Bedding and backfill material shall be free of roots, trash, mud balls and conform to the following limits for deleterious materials:
 - 1. Clay Lumps: Less than 0.5 percent when tested in accordance with ASTM C142.
 - 2. Lightweight Pieces: Less than 5 percent when tested in accordance with ASTM C123.
 - 3. Organic Impurities: No color darker than standard color when tested in accordance with ASTM C40.
- B. Sand Backfill (BS): Where sand backfill is required, Contractor may select, unless specified on Plans and/or Exhibits, sand backfill depending upon availability from the following:
 - 1. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by the Unified Soil Classification System (ASTM D2487) meeting the following requirements:
 - a. Less than 15 percent passing the number 200 sieve when tested in accordance with ASTM C136.
 - b. Material passing the number 40 sieve shall meet the following requirements when tested in accordance with ASTM D4318:
 - 1) Liquid limit not exceeding 25.
 - 2) Plasticity index not exceeding 7.

2. Concrete Sand: Natural sand, manufactured sand, or a combination of natural and manufactured sand conforming to the requirements of ASTM C33 and graded within the following limits when tested in accordance with ASTM C136:

Sieve	Percent Passing
$\frac{3}{8}$ inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

3. Gem Sand: Sand conforming to the requirements of ASTM C33 for course aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C136:

Sieve	Percent Passing
$\frac{3}{8}$ inch	95 to 100
$\frac{1}{4}$ inch	60 to 80
No. 4	15 to 40
No. 10	0 to 5

- C. Select Fill (ES): Select fill shall be lean clay to sandy, lean clay soil with a maximum liquid limit of 35 and a PI range of 8 to 20 and minimum of 60 percent passing the No. 200 sieve. Select fill may consist of lime stabilized soils excavated on site. Lime stabilization of 8-inch loose lifts should be performed by blending 25 pounds of hydrated lime per square yard into each 8-inch loose lift of fill soils.

D. Aggregate Bedding (AB): Where aggregate bedding is required, Contractor may select, unless specified on Plans and/or Exhibits, aggregate bedding for trench stabilization or backfill depending on availability from the following:

1. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C136:

Sieve	Percent Passing
½ inch	100
¾ inch	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

2. Crushed Aggregates: All crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

- a. All materials of one product delivered for the same construction activity from a single source.
- b. Non-plastic fines
- c. Los Angeles abrasion test wear not exceeding 40 percent when tested in accordance with ASTM C131.
- d. Gradations, as determined in accordance with Tex-110-E.

Sieve	Percent Passing by Weight for Pipe Embedment By Ranges of Nominal Pipe Sizes		
	>15"	15" - 8"	<8"
1"	95 - 100	100	-
¾"	60 - 90	90 - 100	100
½"	25 - 60	-	90 - 100
¾"	-	20 - 55	40 - 70
No. 4	0 - 5	0 - 10	0 - 15
No. 8	-	0 - 5	0 - 5

- e. Crushed Stone: Produced from oversize quarried aggregate, sized by crushing from a naturally occurring single source. Crushed gravel or uncrushed gravel are not acceptable material for utility embedment.
- f. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are the same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, base course material, reinforcing steel fragments, soil, debris, or deteriorated concrete fragments.

E. Cement Stabilized Backfill

- 1. Cement stabilized sand shall be used for backfill and bedding as called for on the Plans and/or Exhibits or as directed by the Engineer.
- 2. Cement shall consist of Type I portland cement conforming to ASTM C150.
- 3. Sand shall be clean, durable sand containing not more than the following:
 - a. Deleterious Materials
 - 1) Clay lumps, ASTM C142; less than 0.5 percent
 - 2) Lightweight pieces, ASTM C123; less than 5.0 percent
 - 3) Organic impurities, ASTM C40; shall not show a color darker than the standard color.
 - b. Plasticity index shall be six (6) or less when tested in accordance with ASTM D4318.
- 4. Water shall be potable, free of oils, acids, alkalis, organic matter or other deleterious substances.
- 5. Sand-cement mixture product shall consist of the proper percentage of cement per cubic yard or per ton of sand with sufficient water to hydrate the cement.
- 6. Mix in a pug mill using not less than 2 sacks of cement per ton of mixture with sufficient water to hydrate the cement.

III. EXECUTION

A. Preparation

1. Any clearing and grubbing required shall have been performed pursuant to the appropriate Item.
2. Where concrete or asphalt pavement is to be cut; true saw cuts defining the area to be removed shall have been made (a parallel pavement joint may be used as one boundary), and the pavement broken into pieces suitable for handling by excavating equipment.
3. Layout staking of the utility line shall have been made with adequate definition of alignment and grade of the particular portion to be laid.
4. Utility line materials (Pipe and fittings, conduits, etc.) shall be on site prior to excavation for its placement.
5. Bedding materials and any special backfill material shall be on site, or delivery arrangements definitely made with a reliable source.
6. Any permits pertinent to work to be performed are to be on site. All required notifications shall have been made and any special inspection forces on site or proper and arrangement therefore made.

B. Excavation

1. The trench for the utility line or appurtenance shall be excavated on the given alignment to the grade indicated on Plans and/or Exhibits, minimum cover requirements and construction to govern. Trench sides shall be as near vertical as practical considering wall stability and need for safety. From the bottom of the trench to the top at the proposed pipe, the wall shall be near vertical with slopes, if any, above this level. Where conditions require, vertical wall shall be shored or sheeted and braced. It is the Contractor's responsibility to fully comply with all OSHA safety requirements. Sheet piling to be employed if necessary for trench wall stability.
2. Excavated material suitable for backfilling to be piled as far as practical from edge of ditch, to increase soil stability and allow working room for pipe-laying operations. Excess material is to be removed from the trench bank as soon as practical. Excess is to belong to Contractor and disposition is his responsibility. Placement of excavated material on adjacent private property without written consent of Owner is prohibited. The written consent shall specifically absolve the Owner and Engineer of

any liability in regard to such placement. Excavation material may be placed in existing drainage ditches subject to the following restrictions:

- a. Bypass piping is to be provided.
 - b. Standing water in such ditch to be removed.
 - c. Rain does not appear to be imminent.
 - d. Ability is to be demonstrated that the earth can be removed in a short time if rain does occur during the day, including access for earth-moving equipment.
 - e. All such earth is to be removed before the working day is over and the drainage capacity of the ditch fully restored. Sidewalks are not to be blocked with earth unless approved substitute passage and access is provided.
3. Where trenches are scheduled to be partly or totally in the drainage ditch, the requirements given in the preceding paragraph shall apply. Work shall not be undertaken when rain is threatening. Should rain threaten during the work day, the drainage capacity of the ditch shall be immediately restored and maintained, and the trench backfilled. Full drainage capacity shall be restored at the end of each working day. Any liabilities resulting from drainage obstructions created by construction operations shall occur solely to the Contractor.

C. Trench Water

1. Where practical, ground surfaces shall be graded or diked to prevent the entry of surface water into the open trench.
2. Ground water entering the open trench from the walls and from a firm bottom in small quantities is to be promptly removed by trench pumps. Multiple pumps in good operating order shall be kept on the excavation site for such purposes at all times. Under such trench conditions, the rough excavation grades to drain to the pumps prior to under-bedding placement, with suitable screening to exclude sand from pump suction. Other methods may be employed by the Contractor to achieve the required results. The water level shall be maintained below the pipe invert until full compaction of the pipe bedding can be and is accomplished.
3. In the event that trench pumps are unable to maintain the required level, or, if the water entry is from the bottom of the excavation in such quantities as to make the bottom unstable, or, from the sides in such quantities as to make the walls unstable, then the Contractor shall provide

and operate an effective well point system to dewater the trench to the required pipe laying conditions.

4. Water removed from trenches, from drainage ditches and by well points shall be conveyed to the Owner's drainage system (pipe or ditch) and not discharged upon the roadway, sidewalk or private property in such a manner as not to create damages or public nuisance.
 5. Dewatering or well point systems shall be placed and operated so as to minimize inconvenience and annoyance to public, mechanical equipment shall be housed or shielded to minimize noise; engines are to be provided with efficient noise mufflers. Points and headers shall not block pedestrian and vehicular access to adjacent property. Location of pumping units to be chosen for minimum disturbance. Site to be promptly restored to original condition after point removal.
- D. Pipe Embedment, General: Pipe materials, handling and joining, cable and utility appurtenances are covered in other sections of these specifications. These work elements are to be closely coordinated with the trench excavation, trench backfill, and with embedment placement.
- E. Pipe Embedment: Concrete Steel Cylinder, Corrugated Metal Pipe, Reinforced Concrete Pipe, Cast Iron, Ductile Iron, Vitriified Clay, PVC Pipe, Reinforced Plastic Mortar, Steel.
1. After trenching to rough grade, and trench water removal arrangements are made, the prescribed underbedment, using the dry material of type specified (stabilized sand, bank sand, etc.) and minimum depth shown on details this Item and/or specified herein, is to be placed across the width of the trench and approximately to the grade of the bottom of the pipe, with bell hole left open and additional material on sides. Additional dry, loose material is to be placed in uniformly spaced amounts along pipe (clearing sling points, if any, and bell holes) sufficient to support lower quadrant of pipe barrel for 30 percent or more of its length. The pipe is to be lowered into the trench, aligned, positioned so spigot end is just outside bell and lowered against sand. It is to be checked for vertical alignment of spigot vs. bell and for gradient. The length is to be worked into true alignment and gradient by "bumping", and/or adding or removing underbedment material, so pipe is uniformly supported, under its own weight, for the lower quadrant for not less than 80 percent of its length. The pipe piece is then to be moved horizontally (axially) to make up joint, and additional underbedment material promptly worked under the pipe and tamped to provide support for its lower 1/3 for its entire length. Joint is to be checked for make-up, and exterior protection placement commenced. Pipe bedding material placement to continue, and pipe shall be solidly anchored against axial movement before next joint is made-up.

Remaining bedding and backfill placing to continue until complete.
Trench water not to be allowed to rise appreciably until bedding level is above spring line of pipe.

2. Bedding placement on sides and top to be in layers of 8-inch maximum thickness and mechanically compacted. Placement shall be made on both sides of pipe in such a manner that pipe is not moved horizontally or vertically by placement or compaction.
 3. Bank sand placement on sides and top to be in layers of 8-inch maximum thickness and mechanically compacted to not less than 90% of Texas State Department of Highways and Public Transportation test method TEX-113-E within ± 3 percent of optimum moisture content. Placement shall be made on both sides of pipe in such a manner that pipe is not moved horizontally or vertically by placement or compaction.
- F. Pipe Embedment, 3-Inches and Smaller Water Lines: Small diameter pipe lines not shown to be on a specific grade may be laid on 2-inch loose fill in ditch bottom, and stabilized with loose materials placed sides and top to cover pipe not less than 6-inches, then backfilled.
- G. Backfill (Normal, Select or Regular)
1. Where excavation has been by ladder or wheel trenchers, or:
 2. Where excavation by other types of equipment has resulted in clods not larger than 10-inches in largest dimension, and where excavated materials have been separated into "suitable" and "non-suitable", the surface excavated material (or select imported substitute material) may be pushed into the trench in layers not thicker than 12-inches and compacted. Where excavation has resulted in large clods:
 - a. The clods are to be removed from the trench area and select imported material substituted therefor, or
 - b. The clods are to be reduced to not greater than allowed above, and adequate finer material sufficient to fill voids between large clods provided. Highly-organic excavated material is to be considered "unsuitable" and excluded from the backfill.
 3. Each layer of the backfill is to be mechanically compacted, to densities per ASTM D698 (standard proctor) within ± 3 percent of optimum moisture content. Reopen trenches inadequately compacted and recompact.
 4. Backfill shall be hand placed and compacted under lines crossing the trench, steep slopes, valves, valve boxes, service connections, manholes,

- inlets and other appurtenances and specials.
5. Any trench settlement to be promptly filled, all trenches to be given final dressing immediately after settlement.
 6. Final clean-up to follow backfill operation within 48 hours of construction or earlier if directed by the Engineer.

H. Backfill (Under Roadways and Driveways)

1. Where utility line excavation is open cut across a roadway or driveway, the backfill from top of bedding to bottom of future pavement restoration to be made with cement stabilized sand. The material is to be fresh (mixed not more than 3 hours before final placement). It is to be placed in layers not exceeding 10-inches depth (loose measure) and mechanically compacted from the bottom to top to minimum density not less than 95 percent of optimum, ASTM D698.
2. The surface of the material is to be dampened and covered with polyethylene or otherwise prevented from drying, for 72 hours. Wood bridges or steel plates shall be positioned to permit vehicular traffic, with the remaining portion barricaded for the curing period. After 3 days, the space for future surfacing may be temporarily filled with limestone until pavement restoration is begun and/or restoration undertaken immediately.

I. Crossing Existing Utility and Foreign Lines

1. Where existing utility or pipe lines are found crossing the route of the proposed utility line and are one "main" diameter or more above the proposed utility on undisturbed soil, the Contractor shall "jump" the crossing main with the excavating machinery, leaving a minimum of 1 foot of undisturbed area on each side of the crossing pipe. An opening for the proposed utility is to be tunneled under the crossing pipe line, and the proposed utility carefully threaded through. The crossing line is to be protected from damage at all times. In the event the undisturbed soil is found to be unstable, or if the Engineer decides support is required because of the nature or configuration of the pipe, the Contractor shall:
 - a. Excavate down to the crossing line;
 - b. Provide a temporary strong-back support; and/or
 - c. Provide a reinforced concrete cradle across trench adequately supported to carry crossing pipe and backfill.
2. Where existing utilities or pipe lines are encountered in grade, subject to the approval of the Engineer and conditions of paragraph 1 above, the

Contractor shall:

- a. Adjust the grade of the proposed utility to clear the existing utility.
 - b. Remove and replace the existing utility in a manner shown on the Plans and/or Exhibits or as approved by the Owner of the existing utility.
- J. Removing and Replacing Culverts: Where it is necessary to remove culverts in order to install the proposed utility, the Contractor may at his option:
1. Remove and waste the existing pipe, replacing with new, equivalent pipe, or,
 2. Salvage existing pipe in good condition and relay. New pipe shall be substituted for damaged pipe at the Contractor's expense. The re-laid culvert shall be of the same length, same depth, same location as original, and in no way inferior to the original. No extra pay will be allowed for replacement of damaged culvert pipe whether or not was caused by Contractor.
- K. Miscellaneous Precautions, Restoration of Damages
1. Contractor shall at all times be vigilant in observing overhead electric power and communication equipment.
 2. Damage to overhanging tree limbs shall also be avoided.
 3. Damage to pavement curbing is to be avoided. If such are damaged, the damaged section from joint shall be removed and replaced with curb of like material, dimension, texture and finish.
- L. Test for Displacement of Sewers: After the trench has been backfilled to 2-feet above the pipe and tamped as specified, check the alignment as follows. Flash a light through the sewer between manholes. Use a flashlight or reflect sunlight with a mirror. If the illuminated interior of the pipe line shows poor alignment, pipe displacement, or other defects, remedy them satisfactorily.
- M. Deflection Test of Thermoplastic Pipe (PVC, etc.): Deflection test shall not be performed before 30 days have passed after backfill (installation), but must occur prior to final acceptance. All thermoplastic lines shall be tested by pulling a mandrel or approved deflectometer through the line. All sections indicating five percent (5%) deflection or more shall be removed, reinstalled, and retested for leakage and deflection. A drawing of a typical testing mandrel follows.

IV: PIPE ABANDONMENT

A. Description: This specification shall govern all work and materials required for grouting abandoned utility lines.

B. Materials:

1. Raw Soil: Soil shall be typical clayey soil of the area. It shall be from the project site or other approved source not suspected of being contaminated. The soil shall have a Plasticity Index over 15 and a Liquid Limit not to exceed 65.
2. Lime: Lime shall be hydrated lime, calcium hydroxide, in accordance with AASHTO M 216.
3. Water: Water shall be potable.

C. Construction Methods:

1. Mix Design: The following is given as a typical mix design for trial mix. The mix design is based on damp soil with initial water content of about 15%. The proportions of soil and lime shall not be altered. The Contractor shall determine the amount of water to be added as required to produce a mix at its liquid limit.

a. Trial Mix Design:

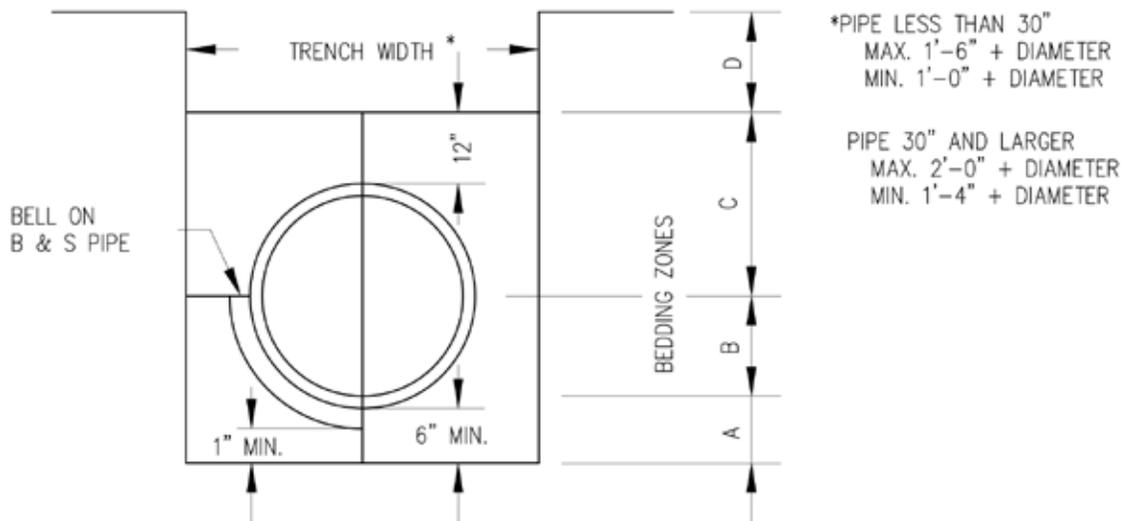
Damp Soil	1,000 lb.
Lime	50 lb.
Water (Approximate)	48 gal.

Consistency shall be checked with liquid limit apparatus.

2. Placement: The Contractor shall grout abandoned lines as indicated on the drawings. Temporary pumping and venting ports shall be placed as required to provide complete filling of the abandoned line and proper placement of the grout. If segregation or “sand packing” is experienced during pumping, the Contractor shall reduce water content of mix or obtain other soil source, as required. Any damage resulting from pumping operation shall be repaired at the Contractor’s expense.

D. Measurement & Payment:

Unless indicated otherwise in the Proposal, Grouting Abandoned Utility Lines shall be measured by the linear foot. Payment shall include all equipment, materials and incidentals required to mix, transport, and place the grout and restore surface at pump ports.



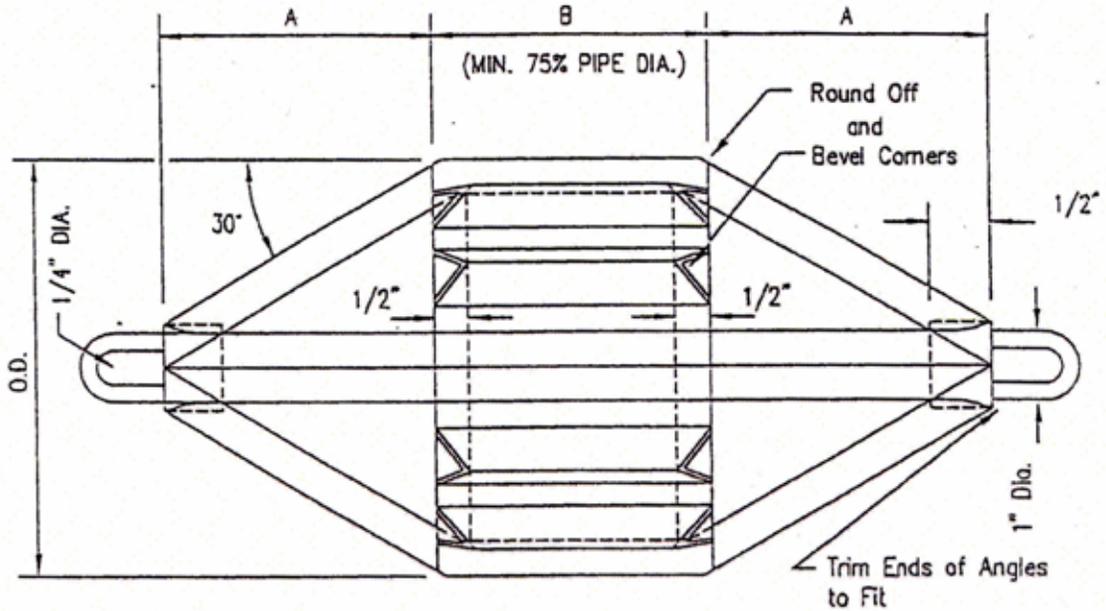
PIPE MATERIAL	BEDDING ZONES				
	A	B	C	D (EARTHEN OR UNPAVED)	D (ASPHALT OR CONCRETE)
CORRUGATED METAL PIPE	CS	CS	CS	EF	CS
REINFORCED CONCRETE PIPE	CS	CS	CS	EF	CS
DUCTILE IRON (PRESSURE PIPE)	BS	BS	BS	EF	CS
DUCTILE IRON (GRAVITY PIPE)	CS	CS	CS	EF	CS
PVC (PRESSURE PIPE)	BS	BS	BS	EF	CS
PVC (GRAVITY PIPE)	CS	CS	CS	EF	CS
STEEL	BS	BS	BS	EF	CS

- BS- BANKSAND.
- AB- AGGREGATE BEDDING.
- ES- SELECT EARTH FILL PLACED SAME DAY AS PIPE IS LAID.
- EF- EARTH FILL PLACED NEXT DAY (OR LATER) AFTER PIPE IS LAID.
- CS- CEMENT STABILIZED SAND.

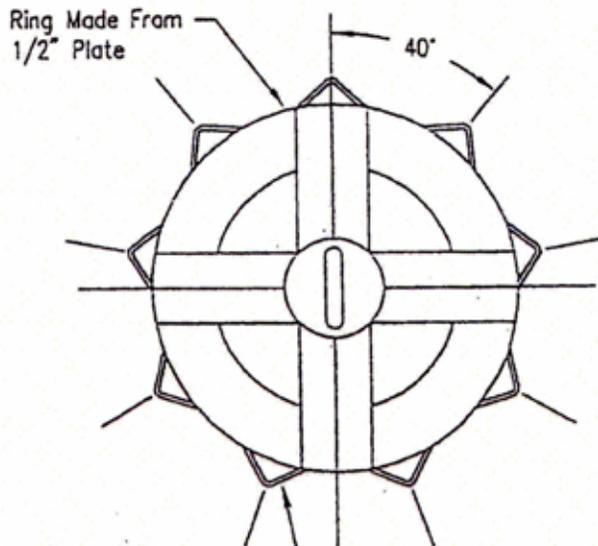
ORDINARY TRENCH
EMBEDMENT & BACKFILL DETAIL

N.T.S.

TYPICAL
GO, NO-GO DEFLECTION TESTING MANDREL
CONSTRUCTED FROM 1/2-INCH ANGLE IRON



SIZE	A (inches)	B (inches)
4	3.0	4
6	4.0	4.5
8	5.3	6
10	6.7	7.5
12	8.0	9
15	10.0	11.5



NOTE:

After welding is completed, true the outside diameter dimension for the full length of "B" to $95\% \pm 0.010"$ of original inside diameter of pipe being tested.

RUNNERS: Min. number to be 9; total must be odd number (i.e. 9, 11, 13, ...).

MANDREL
NOT TO SCALE

ITEM 2224

ENCASING, AUGERING, AND TUNNELING

I. GENERAL

A. Scope

1. This section provides for furnishing pipe and installing it by means of encasing, augering, or tunneling, as shown on the Plans and/or Exhibits and described in this specification. Areas where encasing, augering, or tunneling pipe is needed are shown on the plan.
2. Work performed under this item shall be completed the same day work is begun.

B. Submittals

1. Jacking: Furnish, for review, a plan showing the proposed method of operation. Include the design for the jacking head, the jacking support or back stop, the arrangement and position of jacks, pipe heads and other elements, complete, and in assembled position. Review of the plan does not relieve the Contractor of responsibility for obtaining the specified result. Jacking allowed for encasement pipe only.
2. Furnish wall thickness and schedule of encasement pipe to be used for review.
3. Tunneling: Submit proposed liner method for review. The Contractor remains responsible for the adequacy of the lining method.

C. Related Work (if utilized in this project)

1. Item 2221 - Excavation, Trenching and Backfilling for Utilities
2. Item 2227 - Waste Material Disposal

II. MATERIALS

- A. Use encasement pipe of size shown on Plans and/or Exhibits.

- B. Use carrier pipe of size shown on Plans and/or Exhibits.

III. EXECUTION

A. Jacking

1. If the grade of the pipe at the jacking end is below ground, excavate suitable pits or trenches for jacking and for placing the end joints of pipes. Obtain approval for the pit location. Securely sheet and brace any end trenches cut into the sides of the embankment or beyond, to prevent earth caving.
2. Install pipe required under railroad embankments or roads so as not to interfere with traffic or weaken the structure. Furnish and maintain barricades and lights to safeguard traffic until the backfill is complete. Then remove safety items from the site.
3. Provide heavy duty jacks suitable for forcing the pipe through the embankment. Apply even operating pressure. Provide a suitable jacking head, usually timber, and suitable bracing between jacks and jacking head. This assures uniform pressure on the perimeter. Provide a suitable jacking frame or back stop.
4. Set the pipe to be jacked on guides properly braced together to support the pipe section and direct it in the proper line and grade. Line up the jacking assembly with the direction and grade of the pipe.
5. Excavate embankment material just ahead of the pipe, and remove it through the pipe. Then force the pipe through the embankment with jacks, into the space thus provided.
6. Excavate beneath the pipe to conform to contour and grade for at least 1/3 of its circumference. A 2-inch maximum clearance above the pipe shall taper to zero at the point where the excavation conforms to the contour of the pipe.
7. Extend the excavation not more than 2-feet beyond the end of the pipe. This limit may be decreased, as permitted by the character of the material being excavated.
8. Jack the pipe from the low or downstream end. The final position of the pipe may vary only 1-inch in 100-feet, laterally or vertically. Such variation must be regular and in only one direction. The final grade of the flow line must be in the direction indicated by the Plans and/or Exhibits.

9. A cutting edge of steel plate may be installed around the head end of the pipe. It may extend a short distance beyond the end of the pipe. Angles or lugs are permitted inside the cutting edge to prevent its slipping back onto the pipe.
10. Once jacking is begun, the operation must continue without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.
11. Remove and replace without additional cost, any pipe damaged in jacking operations.
12. Backfill pits or trenches which have been excavated to aid jacking operations, just as soon as the jacking is complete.

B. Augering

1. Provide a pit for boring equipment and workmen. Obtain approval for the location of the pit. Excavate the pit and install shoring. Securely sheet and brace the pit to prevent earth caving.
2. First, bore a 2-inch pilot hole the entire length of the crossing. From the opposite end, check it for line and grade. The pilot hole will be the centerline for the larger diameter hole to be bored.
3. Bore the large diameter hole by mechanical means. Place excavated material near the top of the working pit and dispose of it as required. Use water or other fluids in boring only to lubricate cuttings. Jetting will not be permitted.
4. In unconsolidated soil formations, use a gel-forming colloidal drilling fluid containing at least 10 percent of high-grade carefully processed bentonite. The fluid will help to consolidate the cuttings of the bit, seal the hole walls, and later lubricate the removal of cuttings and the installation of the pipe immediately thereafter.
5. The final position of the pipe may vary only 1-inch in 100-feet, laterally or vertically. Such variation must be regular and in only one direction. Remedy overcutting of more than 1-inch by pressure grouting the entire length of the installation.

C. Tunneling

1. Tunneling is permissible when soil conditions, pipe size, or the use of monolithic sewer would make tunneling preferable to jacking or boring, or

where the Plans and/or Exhibits call for tunneling.

2. Provide a pit for tunneling equipment and workmen. Obtain approval for the location of the pit. Excavate pit and install shoring. Securely sheet and brace the pit to prevent earth caving.
3. Line the tunnel with steel strong enough to support the overburden.
4. Pressure grout or mud jacket the space between the liner plate and the limits of the excavation.
5. Space access holes for placing concrete no more than 10-feet apart.

D. Encasement

1. Auger or jacking shall be performed for encasement pipe as specified above.
2. Steel encasement pipe shall be of size and schedule shown and be installed with a full weld completely around the diameter of each successive joint of encasement pipe.
3. Concrete or corrugated metal encasement pipe shall have approved joints.
4. Encasement operations shall be completed the same day operations begin.

ITEM 2227

WASTE MATERIAL DISPOSAL

I. GENERAL

- A. Scope: Waste material disposal consist of disposal of trees, stumps, logs, brush, roots, grass, vegetation, humus, rubbish and other objectionable matter from operations such as clearing and grubbing, excavation, grading and sanitary sewer cleaning. Unless otherwise specified, the Contractor is responsible for removal and disposal of waste material.
- B. Payment: No separate payment will be made. Include cost of work in contract bid prices.
- C. Related Work (if utilized in this project)
 - 1. Item 2102 - Clearing and Grubbing
 - 2. Item 2221 - Excavation, Trenching and Backfilling for Utilities

II. MATERIALS

Specific materials are not required. Use equipment and materials necessary to properly complete disposal of waste materials.

III. EXECUTION

Disposal Area: Waste materials must be removed from the work site and disposed of in a manner not to damage the Owner or other persons. All waste materials become the property of the Contractor.

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ITEM 2230

ROADWAY EXCAVATION

I. GENERAL

This Item consists of required excavation within the limits of the roadway: the removal and proper utilization or disposal of all excavate materials; and the constructing, shaping, and finishing of all earthwork on the entire length of roadway, in conformity with the required lines, grades, and typical cross sections and in accordance with specification requirements herein outlined.

II. EXECUTION

Construction Methods

All roadway excavation and construction shall be performed as specified herein and the completed roadway shall conform to the established alignment, grades and cross sections.

All suitable excavated materials shall be utilized, insofar as practicable, in constructing the required roadway sections or in uniformly widening embankments, flattening slopes, etc., as directed by the Engineer. Unsuitable material encountered below subgrade elevation in roadway cuts, when declared "Waste" by the Engineer, shall be replaced with material from the roadway excavation or with other suitable material as directed by the Engineer.

"Waste" will not be permitted unless specifically indicated on Plans and/or Exhibits or required by written order of the Engineer. During construction the roadbed and ditches shall be maintained in a condition to insure proper drainage at all times. Ditches and channels shall be so constructed and maintained to avoid damage to the roadway section.

Excess base material shall be stockpiled at a location designated by the Engineer.

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ITEM 2245

LIME-STABILIZED SUBGRADE

I. GENERAL

Consists of treating subgrade by pulverizing, adding lime, mixing, and compacting to required lines, grades, and cross-sections. Applies to natural ground, cuts, embankments, or existing pavement sections.

II. MATERIALS

- A. Type A - Hydrated Lime: To conform to requirements of the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 1993 Edition, Item 264.
- B. Type B - Commercial Lime Slurry: To conform to requirements of Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 1993 Edition, Item 264.

III. EXECUTION

- A. Preparation: Properly prepare subgrade prior to beginning lime treatment. Scarify or excavate to depth shown. Provide machine that will cut and scarify to indicated depth. Unstable material below indicated depth to be corrected by proper compaction. Distribute lime uniformly over subgrade at required rate. Do not place lime that cannot completely receive first mixing during same working day.
- B. Placing: Place lime by either one of the following methods:
 - 1. Dry Placing: Place lime using approved spreader or by bag distribution. Do not spread with maintainer or motor grader. Do not place lime during windy or other adverse weather conditions. Sprinkle until proper moisture content has been secured.
 - 2. Slurry Placing: Mix Lime with water in trucks and place, using approved distributor. Make successive passes over measured section of roadway until proper lime and moisture content has been secured. Furnish truck with approved agitator which will keep lime and water uniformly mixed. Do not

change grade of slurry without prior approval.

- C. Mixing: Mixing procedure to be the same for either “dry placing” or “slurry placing.” Obtain uniform mixture and moisture content.
1. First Mixing: Thoroughly mix soil and lime to required depth, using approved pulver-type road mixer. Mix until homogeneous, friable mixture of lime and soil is obtained, free of clods or lumps. Add proper moisture and cure from 1 to 2 days as required. Keep moist during curing period.
 2. Final Mixing: Uniform mix, after proper curing, using approved pulver-type road mixer. All clods or lumps to be reduced in size by pulverization methods. When all nonslaking aggregates (sound or firm particles) retained on No. 4 sieve are removed, remainder of material to meet following requirements when tested dry by laboratory sieves:

Percent

Minimum Passing 1¾-Inch Sieve	100
Minimum Passing No. 4 Sieve	60

Hydrated lime exposed to open air for period of 6 hours or more, or to excessive loss due to washing or blowing between time of application and mixing, will not be accepted for payment.

- D. Compaction: Begin compaction immediately after final mixing. Provide optimum moisture during compaction. Begin at bottom and compact, using approved tamping rollers, until entire required depth is uniformly compacted. Compact treated material in such manner that it will not be mixed with underlying subgrade material. All irregularities or weak spots to be corrected immediately by replacing material and recompacting. Maintain surface in smooth condition until base course is placed. Acquire density of at least 95 percent of maximum dry density at optimum moisture content of treated material as determined by AASHTO Standard Method T-99-74 Density. Use approved pneumatic-type roller for final surface rolling. Moist-cure completed subgrade section for minimum of 4 days before placing pavement.

IV. QUALITY ASSURANCE

- A. Store lime in weatherproof containers, bins or buildings. Protect lime from any dampness or moisture.
- B. Weigh lime furnished in trucks on approved scales.
- C. Lime furnished in bags to bear manufacturer’s certified weight.

ITEM 2500
STORM SEWERS

I. GENERAL

A. Scope

The work to be performed under the specifications shall consist of the furnishing and installation of pipe sewer mains, laterals, stubs, and leads for storm sewer inlets. The type or types of pipe to be furnished and installed under the contract will conform to the type or types designated on the Plans and/or Exhibits and as set out on the bid proposal sheet.

B. Related Work (if utilized in this project)

Site Work

1. Item 2102 - Clearing and Grubbing
2. Item 2221 - Excavation, Trenching and Backfilling for Utilities
3. Item 2224 - Encasing, Augering and Tunneling Pipe
4. Item 2227 - Waste Material Disposal

C. Measurement and Payment

See Item 1400 - Measurement and Payment

II. MATERIALS

- A. Reinforced Concrete Pipe: Provide reinforced concrete pipe which conforms with ASTM C-76, of size and class shown or, with the following additional requirements. For circular pipe with elliptical reinforcing, apply a readily visible stripe at least 12-inches long painted or otherwise applied on the inside and outside of the pipe at each end so that when the pipe is laid in the proper position the line will be at the center of the top of the pipe.

- B. Non-Reinforced Concrete Pipe: Provide non-reinforced concrete pipe which conforms to ASTM C-14 of size and class specified.
- C. Corrugated Metal Pipe: Provide corrugated metal pipe fabricated from corrugated sheet metals which shall comply with the requirements of AASHTO Designation: M36. The minimum gauge number of the galvanized sheet shall be as designated on the Plans and/or Exhibits.

Where specified, the pipe shall be coated inside and out with a bituminous coating which shall be 99.5 percent form thickness of 0.05-inch, measured on the crest of the corrugations; shall adhere to the metal tenaciously; shall not chip off in handling; and shall protect the pipe from deterioration as evidenced by samples prepared therefrom successfully meeting the Shock Test and Flow Test.

- D. Pipe Joints: Unless otherwise specified, joints in non-reinforced concrete pipe, reinforced concrete pipe, and clay sewer pipe shall be cold compound joints or neoprene joints as hereinafter described. Cold Compound joints shall be used on non-reinforced concrete pipe only.

- 1. Bell and Spigot Pipe-Cold Compound Joints: The inside of the pipe bells and the outside of the spigot ends shall, while dry, be completely coated with joint primer. The coating shall be applied sufficiently in advance so that the primer will be thoroughly dry when the pipe is laid. Pipe 24-inches and larger shall be primed at the point of manufacture. Apply a fillet of Compound on the bottom half of the inside of the bell, press enough dry twisted jute into the compound to pass the pipe and lap at the top and shove home the spigot of the pipe. Bring the jute around the pipe and firmly caulk into place. The jute should be sufficient to fill one fourth the depth of the bell. Fill the remaining three-fourths of the depth of the bell with compound taking care to leave no voids and provide sufficient compound to form a fillet sloping 45° from the outer end of the bell to the barrel of the next pipe.

Compound used for these joints shall be a well-known brand of material of proven worth, uniform in consistency and approved by the Engineer as being equal to Talcote No. 0.52 or Gulf States No. GS 702 or 722. Primer shall be of the type recommended by the manufacturer of the compound used.

- 2. Tongue and Groove Pipe-Cold Compound Joints: Unless otherwise specified, this type of joint shall be used for tongue and groove pipe joints not made with approved neoprene or rubber gaskets. The compound and primer shall be the same as described herein for use with bell and spigot pipe.

Both ends of the pipe shall, while clean and dry, be coated with primer on all surfaces that will be in contact with the compound. The primer shall be allowed to dry before the pipe is laid. 24-Inch and larger pipe shall be primed at the factory. After pipe has been set to proper line and grade in the trench a ½- inch thick layer of the compound shall be troweled or otherwise placed on the groove end of the pipe covering the joint face around the entire circumference. Next the tongue end of the next pipe shall be shoved “home” with sufficient pressure to make a tight joint. Care shall be taken to avoid leaving ridges of the compound projecting into the pipe in a manner that would obstruct the flow. The Engineer will make the necessary adjustment in the quality and consistency of the compound as the work progresses.

An outside band of the joint compound shall be installed completely around the circumference of the pipe at the joint. This will necessitate digging “bell holes” at each joint. The band shall have a thickness at the center of at least ¾-inch tapering uniformly to nothing approximately 3-inches each side of the center.

Where Class A bedding is used, the band may be omitted on portions of the joint that will be embedded in the cement stabilized sand bedding.

3. Neoprene or Rubber Gasket Joints: Joints made with neoprene, rubber, or other similar materials that has been approved by the Engineer will be acceptable for use with reinforced or non- reinforced concrete pipe, either tongue and groove or bell and spigot. The ends of the pipe must be accurately made and designed for use with the gaskets. The type of joint and the gasket must have the approval of the Engineer and may be submitted to the Owner for approval prior to submitting bids for work on which its use is intended. The joint materials and workmanship shall be such as to provide a water-tight joint. Joints shall, unless otherwise specified, be pointed on the outside with cement mortar.

III. EXECUTION

A. Pipe Handling

1. Pipe shipped to the job shall be properly protected against normal forces during transit from manufacturing site to project site.
2. Contractor shall provide and employ slings, lifting cables, strong backs, etc. as recommended by manufacturer in handling pipe, fittings, and

appurtenances on the job. Proper care against damage from rough handling shall be exercised at all times. Under no circumstances will pipe be dropped, nor will pipe be allowed to slam together.

3. Pipe is to be strung only on street right-of-way and easements; pipe is never to be strung in drainage ditches. Strung pipe shall not be placed so as to prevent or unreasonably obstruct access of people or vehicles to residences or to businesses. Loose items are not to be left in street right-of-way. Delivery of piping materials is to be scheduled so that pipe is strung a maximum of two (2) weeks prior to pipe laying.
4. Pipe will be strung so bells or tongue face in the direction of laying advancement.

B. Pipe Laying General

1. Use specified piping materials corresponding to the material, size, type, etc. indicated on Plans and/or Exhibits.
2. Do not lay pipe in water, or when trench or weather are unsuitable for work, except with permission of the Engineer. Keep water out of trench until jointing is complete. When work is not in progress, close ends of pipe and fittings securely so that no trench water, earth, or other substances will enter pipes or storm sewer structures.
3. Keep the inside of the pipe free from foreign matter during operations by plugging or other approved method.
4. Place pipe so that the full length of each section rests solidly upon the pipe bed, with recesses excavated to accommodate joints. Take up and relay pipe when the grade or joint is disturbed after laying.
5. Where pipe ends are left for future connections, install brick and mortar, plugs or caps, as shown.
6. Handle pipe and accessories so that all pipe placed in the trench is sound and undamaged.
7. Before installation, inspect pipe for defects. Replace sections of pipe found to be defective, damaged, or unsound.
8. Pipe barrels to be clean at time of joining. Swab as required to remove dirt, mud, and other foreign matter.

C. Bedding and Pipe Placement

Refer to Item 2221 - Excavation, Trenching and Backfilling for Utilities and details on drawing.

D. Joints

1. Make of joints generally to be in accordance with manufacturers directions and reference standards.
2. For pipe using a compressed elastomeric gasket joints, bell and spigot surfaces and gasket shall be clean. Area adjacent to gasket and gasket groove to be free of foreign particles. Spigot beveled as required. Gasket or spigot end lubricated per manufacturer's directions. The two pieces to be joined are to be in axial alignment and restrained from rotation around the axis, until the pipe is "home." The position of the gasket is to be checked all around with a feeler gauge when so recommended, or other recommended checks made to insure proper gasket positioning, and/or pipe end gap. Pipe ends are not to be butted. The force necessary to push the pipe "home" shall be closely controlled, applied in such a manner as not to displace nor damage piping being joined.

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ITEM 2513

HOT-MIX ASPHALTIC CONCRETE PAVEMENT

I. GENERAL

This Item governs for hot-mix asphaltic concrete surfacing consisting of a base course, a leveling-up course, a surface course, or any combination of these courses; each course composed of a compacted mixture of mineral aggregate and asphaltic material and constructed on an approved subgrade, a subbase course, a base course, or in case of a bridge, on prepared floor slab. Construct in accordance with these specifications and in conformity with lines, grades, compacted thickness, and typical cross-sections shown on Plans and/or Exhibits or described in preceding special provision.

II. MATERIALS

- A. Mineral Aggregate: Composed of a coarse aggregate, a fine aggregate, and a mineral filler, and if approved by an Engineer a suitable mineral admixture which may or may not increase or decrease the quantity of asphaltic cement in mixture. Exact proportion of admixture, if approved to be determined by Engineer. Submit samples of coarse aggregate, fine aggregate, and mineral filler and test in accordance with prescribed methods. Approval of both materials and source of supply must be obtained prior to delivery of any material.
- B. Coarse Aggregate: Consists of shell (max. 40% by weight), slag, or limestone, or a mixture therefore as hereinafter specified, of uniform quality throughout and free from dirt, organic, or other injurious matter occurring either freely in material or as a coating on aggregate. Abrasion of slag or limestone from which coarse aggregate is made of not more than 35 when subjected to Los Angeles Abrasion Test (AASHTO-96). Los Angeles Abrasion Test for shell, not more than 50 (AASHTO, T-96).
- C. Fine Aggregate: Consists of sand or a combination of sand and stone, shell screenings, or slag screenings. Sand composed of sound, durable stone particles, free from loam or other injurious foreign matter. Screenings of same or similar materials as specified for coarse aggregate. Sand or combination of sand and screenings to meet the following requirements when tested by standard laboratory methods:

Percent by Weight

Passing No. Sieve	100
Passing No. 200 Sieve	10-30

The plasticity index of that part of the fine aggregate passing the No. 40 sieve to be not more than 6.

- D. Mineral Filler: Consists of thoroughly dry stone dust, slate dust, oyster shell dust, Portland cement, or other mineral dust approved in writing. Free from foreign, deleterious, and other injurious matter. Meet following grading requirements when tested by standard laboratory methods.

<u>Percent by Weight</u>	
Passing a No. 30 Sieve	95-100%
Passing a No. 80 Sieve	75%
Passing a No. 200 Sieve	55%

- E. Asphalt: Grade of asphalt as designated by Engineer. If more than one type of asphaltic concrete mixture is specified for project, only one grade of asphalt will be required for all types of mixtures. Unless otherwise noted in the plans/exhibits asphaltic placement and or repair will consist of 8-inch thick asphalt base, Grade 2, PG-64 per TXDOT Standard Specification 292. Surface course asphaltic placement and or repair will consist of 2-inch thick surface course Type “D” per TXDOT Standard Specification 340.

Asphaltic materials, including tack coat, to meet requirements of the Item, “Asphalt, Oils, and Emulsions,” of the Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges, 2004 Edition or most current.

- F. Paving Mixture: To consist of a uniform mixture of coarse aggregate, fine aggregate, asphaltic material and mineral filler if required.

Grading of each constituent such as to produce, when properly proportioned, a mixture conforming to limitations for grading for type specified. Exact proportions of each constituent producing total aggregate within these limits to be directed, and to conform to the requirements of Article 340.3, “Paving Mixtures,” of the Texas Highway Department Standard Specifications for Construction of Highways, Streets and Bridges, 2004 Edition or most current.

- G. Variation of percentage of bitumen in any mixture not more than one-half of one percent from proportion established by Engineer.

When required samples of hot mixture may be taken from trucks or from finished pavement. Determine minimum weight of test specimen in grams by multiplying 3,000 by maximum size aggregate in inches. Variation of specimen from grading

proportions specified for mix, when tested by standard methods (in which benzol may be used as solvent), of not more than 5 percent.

III. EXECUTION

- A. Proportions of various materials entering into asphaltic mixture as directed and in accordance with these specifications. Engineer or his authorized representative to have access at any time to all parts of paving plant. Use satisfactory equipment and construction methods as hereinafter specified.
- B. Store or stockpile separately various sizes of mineral aggregate as received. Feed various sizes of mineral aggregate to dryer by means of mechanical device that will give a uniform and constant feed of each size incorporated to control temperature and grading of mineral aggregate.
- C. Dry mineral aggregate in such manner that finer particles will not escape with furnace gases. Heat aggregate in a suitable apparatus which provides continuous agitation during heating. Provide efficient and positive control of temperature so that aggregate is not damaged and mixture produced has a temperature between 250 degrees F and 375 degrees F. Provide recording thermometer which will record temperature of aggregate as it leaves dryer. Equip recording thermometer with a double-pen in order to record both temperature of rock and temperature of asphalt incorporated in batch. Record temperatures on 24-hour charts. Furnish dryer or dryers of sufficient size to dry and heat amount of aggregate required to keep plant in continuous operation.
- D. Bin sizes and screening capacity sufficient to screen and store amount of aggregate required to properly operate plant and keep plant in continuous operation at full capacity. Bins to continuous operation at full capacity. Bins to contain sizes of aggregate as specified in Article 340.4. "Equipment." Sub-article, "Screening and Proportioning," of the Texas Highway Department Standard Specifications for construction of Highways, Streets and Bridges, 2004 Edition or most current.

Provide bins with tight cut-off gates so that there is no leakage of mineral aggregate or mineral filler into weigh box. Weigh box for mineral aggregate of sufficient capacity to hold a complete batch of aggregate and mineral filler without wasting or leveling by hand, and so designed with opening in top that, if in charging, an excess of one size of mineral aggregate is introduced into box, it may be removed by operator. Provide weigh box with a close fitting and quick operating cut-off gate so that there is no leakage of mineral aggregate into mixer.
- E. Scales: Scales for weighing mineral aggregate and asphaltic material shall equal the weighing equipment used at stationary commercial asphaltic concrete plants as approved by the Engineer.

Scales of multi-beam type to have sufficient weighing beams to weigh each grade of aggregate separately and also filter dust separately. Furnish scales with tare beam for balancing. Equip beam scales with a tell-tale dial indicator of 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 be considered unsatisfactory. In case vibration of plant interferes with accurate weighing, insulate scales satisfactorily against shock or vibration.

- F. Provide ample asphalt cement storage to meet requirements of Plans and/or Exhibits. Heat asphalt cement in storage by steam coils, absolutely tight to prevent leakage of moisture into asphalt. Temperature of steam for heating not in excess of 400 degrees F. No direct fire heating of asphalt permitted. Agitation of asphalt with steam or air not permitted.

Provide steam heating system of type and capacity as to insure maintaining asphalt cement at a uniform draw-off temperature at asphalt cement bucket of between 275 degrees F to 375 degrees F. Maintain temperature with an efficient and positive control of heat at all times. Any asphalt cement heated above 375 degrees F, either before or during mixing with mineral aggregate, will be rejected.

Use quick cut-off type draw-off valve at asphalt cement bucket that will not leak any asphalt into bucket after required weight of asphalt cement has been drawn. Asphalt supply line of circulating type, and equipped with recording thermometer indicating temperature of asphalt a draw-off valve. Recording thermometer may be combined with recording thermometer used in recording temperature of aggregate by using a double-pen recorder.

Asphalt cement weigh bucket of type from which asphalt will flow into mixer for approximately full width of mixer so as not to deposit asphalt cement in one place in mixer. Scales for weighing asphaltic cement of springless dial type arranged for quick adjustment at zero to provide for change in tare. Provide pointer to indicate weight of asphalt cement required in one batch.

- G. Mixer of twin-pug-mill type and capacity of not less than 3,000 pounds in single batch. Number and position of blades such as to give a uniform and complete circulation of batch in mixer from center to four ends of mixer arms and back to center. Mixers which tend to segregate mineral aggregate or fail to secure thorough and uniform mixing with asphalt cement and filler dust will not be used. Determination of thorough and uniform mixing will be made by mixing standard batch for required time and then dumping batch and taking samples from different parts of batch is uniform throughout, or otherwise mixer will be rejected.

Provide mixers with an automatic time lock on discharge gates of mixer and weight box and lock for a period of 45 seconds after all of mineral aggregate has

been introduced into mixer. When discharged, mixture to have a temperature of 300 degrees F to 375 degrees F. Dump door or doors of mixer to be tight to dry mineral aggregate or dust so that there is no spilling from pug mill. In introducing batch into mixer, introduce mineral aggregate first, then thoroughly mix for a period of five to ten seconds before asphaltic cement is added. Continue mixing for required time, or longer if necessary to produce a mixture of uniform consistency.

- H. Tack Coat: Thoroughly clean surface of base or surface of concrete bridge, as applicable, by brooming with wire brushes before asphaltic surface mixture is laid, when tack coat is shown, or if directed, give base an application of cut back asphalt applied as directed with an approved sprayer and at rate of application of 0.05 to 0.15 gallons per square yard. Cut-back asphalt as specified under Article II, Paragraph E, or made by combining 50 percent material (as specified) and 50 percent gasoline.
- I. Laying Materials
 - 1. Construct pavement on previously completed and approved subgrade, base, existing pavement, bituminous surface or in case of a bridge, on prepared floor slab.
 - 2. Place no asphaltic mixture or tack coat when air temperature is below 45 degrees F and is falling. Asphaltic mixture or tack coat may be placed after air temperature is above 40 degrees F and is rising, provided temperature is taken in shade away from artificial heat. Place no asphaltic mixture or tack coat when weather conditions, in opinion of Engineer, are unsuitable.
 - 3. Haul asphaltic concrete mixture, heated and prepared as specified, to site of work in tight vehicles previously cleaned of all foreign materials and, if considered necessary, covered with canvas of sufficient size to protect entire load. Arrange dispatching of vehicle so that all material delivered may be placed and receive its initial rolling in daylight. Lay mixture only on approved base course, which has been tack coated as previously specified and free from all foreign materials. Paint contact surfaces of curbs and structures and all joints with thin uniform coating of cut-back or emulsified asphalt as required for tack coating. Lay mixture at temperature of 250 degrees F to 375 degrees F and spread and compact, using an approved finishing machine. Use finishing machine capable of producing finished surface that conforms to required typical sections and surfaces tests. Areas nor accessible for finishing machine may be hand spread and shaped when approved.

4. Use approved finishing machine of screeding and troweling type. Forms adequate to control lateral thrust due to rolling. If a finishing machine designed to run on forms is used, operate it on header curb, steel forms, or rigid steel faced forms approved by Engineer. Set forms to line and grade.
5. Oil or saturated solution of hydrated lime may be used for lubricating shovels and trucks to facilitate handling of asphaltic materials. Use of an excessive amount of either material not permitted.
6. Adjacent to flush curbs, gutters, liners, and structures, finish mix uniformly high so that when compacted it will be slightly above edge of curb or flush structure.
7. When Plans and/or Exhibits require application of a non-skid surface of asphaltic concrete pavement, spread Type "B", "Type "C", "Type "D" or Type "E" mix, as specified, so that after lightly rolling, it has a finished thickness of approximately 3/8-inch less than completed thickness of pavement shown. After this course has been laid, spread mixture specified as Type "F" with sufficient thickness so that, after receiving ultimate compression, compacted pavement complies with requirements of typical cross-sections shown, but in no case will weight of Type "F" mixture be less than 35 pounds nor more than 50 pounds per square yard of surfacing.
8. While still hot, and as soon as it will bear roller without undue displacement or hair cracking, compress surface thoroughly and uniformly with an acceptable power-driven 3-wheel roller weighing not less than 10 tons. Weight on two rear wheels of roller obtained by power-driven tandem roller weighing not less than eight tons.

Rolling shall start longitudinally at the sides and proceed toward the center of the pavement, over-lapping on successive trips by at least one-half of the width of the rear wheels. Alternate trips of the roller shall be slightly different in length. If necessary, the pavement shall then be subject to diagonal rolling in each direction with a tandem roller, the second diagonal crossing the lines of the first.

Rolling shall be continued until no further compression can be obtained and all roller marks are eliminated, and at a rate of not more than 20-tons of mixture per hour for each roller used.

The motion of the roller shall at all times be slow enough to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller, or by any other cause, shall at once be corrected by the use of rakes and of fresh mixture where required. The roller must not stand on the completed pavement which has not cooled to

normal atmospheric temperature. To prevent adhesion of the surfacing mixture to the roller, the wheels shall be kept properly moistened with water but an excess of water will not be permitted.

The roller's drive wheel shall be ahead of the tiller wheel at all times during compaction. If a vibratory roller is used for compaction, a very low amplitude is to be used and the roller should be vibrating only when it is moving.

9. Time Limit vs Temperature

**Cessation Requirements
Recommended Minimum Laydown Temperature**

Base Temp Degrees F	1/2	3/4	1	1 1/2	2	3² & Greater
20-32	---	---	---	---	---	285*
+32-40	---	---	---	305	295	280
+40-50	---	---	310	300	285	275
+50-60	---	310	300	295	280	270
+60-70	310	300	290	285	275	265
+70-80	300	290	285	280	270	265
+80-90	290	280	275	270	265	260
+90	280	275	270	265	260	255
Rolling time, Minutes	4	6	8	12	15	15

* Increase by 15 degrees when placement is on base or subbase containing moisture.

Base temperature is the temperature of the layer (Previous mat or base) on which the mat is placed.

The above chart gives a time limit in which the mat needs to be completely rolled for density before the mat cools to 175 degrees F. This temperature was selected as about the temperature below which rolling produces little compaction. The recommendations are, in effect, the "worst" conditions. These are only minimum requirements.

- 10. Along curbs, headers, and similar structures, and at places not accessible to roller, or in such positions as will not allow thorough compaction with roller, compact mixture thoroughly with lightly oiled tamps.
- 11. Surface of pavement after compression to be smooth and true and conform to line, grade and typical cross-sections shown. No deviation in excess of 1/8-inch per foot from nearest point of contact when surface is tested with

a standard 10-foot straight-edge laid parallel to center line of roadway. Maximum ordinate measured from face of straight-edge not in excess of 1/4-inch at any point. Immediately correct any areas of surface not meeting these requirements. Roll mixtures until course is unyielding and true to established grade and cross-section.

12. Place surface course as nearly continuous as possible. Allow roller to pass over unprotected end of freshly laid mixture only when laying of course is discontinued for such length of time as to permit mixture to become chilled. In such cases, when work is resumed, material laid must be either cut back so as to produce a slightly beveled edge for full thickness of course or make a suitable lap joint.

Remove old material which has been cut away and lay new mix against fresh cut. If desired, a stout rope may be stretched across pavement where joint is to be made. When work is resumed, cut materials laid back to rope. Remove altogether with surplus material, and lay fresh mix against joint thus formed.

Hot smoothing irons may be used for sealing joints, but in such cases exercise extreme care to avoid burning surface.

13. Except in an emergency, or where shown, open no portion of finished wearing course to traffic until twelve hours after completion of rolling.

ITEM 2515

CONCRETE PAVEMENT

I. GENERAL

- A. This Item governs for construction of concrete pavement for roadways, driveways, turnouts, and concrete curbing. Unless specified otherwise in proceeding Special Provision or on Plans and/or Exhibits, pavement to conform to residential requirements.
- B. Related Work (if utilized in this project)
 - 1. Item 3310 - Concrete
 - 2. Item 3200 - Concrete Reinforcement

II. MATERIALS

- A. Concrete: Item 3310 - Concrete: Class as shown on Plans and/or Exhibits or in Proposal.
- B. Reinforcing Steel: Item 3200 - Concrete Reinforcement: Bar size and type as shown on Plans and/or Exhibits.
- C. Expansion Joint Material: To be in accordance with section and location as shown on Plans and/or Exhibits.
 - 1. Fillers
 - a. Pre-molded
 - 1) Asphalt filler board per ASTM D994-71.
 - 2) Premolded joint material per ASTM D1751-73.
 - b. Wood
 - 1) Redwood: Boards shall be heartwood and shall be free from sapwood, knots, clustered birdseye, checks & splits.

Maximum weight per cubic foot when oven dried to constant weight to be 30 pounds.

- 2) Other Woods: Cypress, Gum, Southern Yellow Pine, or Douglas Fir Timber may be used with prior approval of the Engineer. With the exception of Cypress, all boards shall have a creosote or penta chlorophenol treatment of 6 pounds per cubic foot. Maximum weight per cubic foot when oven dried shall not be greater than 30 pounds per cubic foot.

c. Joint Sealing Material

- 1) Per ASTM D1190-74. Also to be used in other types of joints as required.
- 2) Load Transmission Devices: To be of type and size as shown on Plans and/or Exhibits.
- 3) Metal Installing Devices: Such as welded wire bar chairs, bar stakes, marker channels, channel caps, deformed metal strips, etc. shall be as shown on Plans and/or Exhibits.

D. Forms

1. Pavement

- a. Wood Forms: (Used only in residential construction to be 2X material, free from warps, bends, and kinks, and sufficiently true to provide a straight edge on concrete). Use precautionary methods to prevent leakage of mortar through or under side forms. Top of each form section, when tested with a straight edge, to conform to the requirements specified for the surface of completed pavement.
- b. Metal Forms: Use metal forms of approved shape and section. Preferred depth of form to be equal to required edge thickness of pavement. Forms with depths greater or less than 1-inch of pavement thickness may be used. Forms with less depth than pavement thickness to be brought to required depth by securely attaching wooden planks of approved section and size to bottom of form. Use form section at least 10-feet in length, and provide for staking in position with not less than 3 pins. Use forms of adequate strength to withstand machine loads without visible springing or settlement. Use forms free from warps, bends and kinks, and sufficiently true to provide a straight edge on concrete.

Top of each form section, when tested with a straight edge, to conform to the requirements specified for the surface of the completed pavement. Use flexible or curved forms of wood or metal of proper radius for curves of 200-foot radius or less.

- c. Slip Forms: Slip form equipment to be equipped with a longitudinal transangular finishing float adjustable to crown and grade. Float to extend across pavement to the side forms and/or slab.

2. Curbs

- a. Wood or Metal: Wood or metal curb forms to be of approved section, straight and free of warp. Outside curb forms to have a depth at least ½- inch greater than height of curb. Rigidly attach inside curb forms (if desired) to outside forms.
- b. Machine Laid: Equipment to conform to the requirements as specified under Article 111 Execution. Use flexible or curved forms of wood or metal of proper radius for curves but not to exceed radius recommended by curb machine manufacturer.

E. Metal Supports: Supports for reinforcing steel to be metal of approved shape and size, and spacing to conform to details shown on Plans and/or Exhibits.

F. Materials for Curing

- 1. Burlap: Mats to be in good condition, clean, and free of any substance which would have deleterious effect on concrete.
- 2. Cotton Mats: Mats to be in good, clean, and free of any substance which would have deleterious effect on concrete.
- 3. Waterproof Paper: Per ASTM C171-69.
- 4. Membrane Curing Compounds: Conform to ASTM C309-74.
- 5. White Polyethylene Sheeting: Sheet having thickness not less than 4 mils (.004-inch).

G. Grouting

- 1. Material and mixtures for grouting curb dowels.
 - a. Proportion by weight.

- b. One part Portland cement, Type I or Type II.
 - c. One part clean, sharp sand.
 - d. Seven-tenths part nonshrinking grout aggregate.
 - e. No more than 5½ gals. water per sack cement.
2. Other: Use mixture by weight of one part Portland cement and two parts sand for general purposes. If space to be grouted is less than one inch and is impossible to tamp grout, use one-to-one mix. Where space to be filled with grout is large, use original concrete mixture. Use stiff mixture for grout to be tamped, produced by prolonged mixing. To obtain stiff grout, mix mortar using amount of water required to thoroughly mix ingredients, then continue mixing without additional water until grout is stiff enough to be compacted by tamping when placed. For grouting blockouts for embedded pipes and similar items, use grout to which 5 pounds of nonshrinking grout aggregate per sack of cement has been added.

III. EXECUTION

- A. Subgrade: Excavate, shape, and compact subgrade to grades, sections and densities shown on Plans and/or Exhibits. Maintain drainage of subgrade at all times. Test subgrade section with an approved template, operated and maintained by Contractor. Wet down subgrade sufficiently in advance of placing pavement. No pavers, batch trucks, or other equipment to be permitted between forms during paving operations.
- B. Wood and Steel Forms
- 1. Setting: Set forms on compacted subgrade, cut true to grade on that entire form section is supported by subgrade. Stake metal form sections with at least 3 pins per section, with a pin on each side of every joint. Adequately stake wood form sections to prevent bows in form and to keep form sections to grade. Join form sections to prevent displacement. Clean and oil forms with form oil each time they are used. Set forms to line and grade for at least 200-feet ahead of mixer. Check conformity of alignment and grade immediately prior to placing concrete.
 - 2. Removal: Leave forms in place for at least 12 hours. Remove forms without injury to concrete. Immediately repair damage resulting from form removal. Point up all exposed honeycombed areas with approved mortar. As soon as curb forms are removed, backfill behind curbs with approved material and compact to 90 percent Standard Proctor density.

- C. Slip Forms: Equipment to be provided with traveling side forms of sufficient dimensions, shape and strength to support concrete laterally for sufficient length of time during placement to produce pavement of required cross-section. Concrete to be distributed uniformly into final position by slip form paver and horizontal deviation in alignment of edges not to exceed 1¼-inches from established alignment.
- D. Concrete Placing and Handling - Wood and Steel Forms
1. Deposit concrete on subgrade in such manner as to require as little rehandling as possible. Use shovels for hand spreading of concrete. Use of rakes will not be permitted. Place concrete in a rapid, continuous operation.
 2. Consolidate all concrete placed for pavement by an approved mechanical vibratory unit designed to vibrate the concrete internally. A vibratory member equipped with synchronized vibratory units to extend across pavement practically to, but not to come in contact with, side forms. Space separate vibratory units at sufficiently close intervals to provide uniform vibration and consolidation to entire width of pavement. Mount mechanically operated with vibrators in such manner as not to come in contact with forms or reinforcement and not to interfere with transverse or longitudinal joints.
 3. Furnish hand-manipulated mechanical vibrators in number required for provision of proper consolidation of concrete along forms, at joints, and in areas not covered by mechanically controlled vibrators.
- E. Concrete Placing and Handling - Slip Forms
1. Concrete, for full paving width, to be effectively consolidated by internal vibration, with transverse vibrating units, or with a series of longitudinal vibrating units. Internal vibration to mean vibration by means of vibrating units loaded within the specified thickness of pavements section and at a minimum distance ahead of screed equal to pavement thickness.
 2. When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement to be equipped with protective pads on crawler tracks or rubber-tired wheels, offset to run a sufficient distant from edge of pavement to avoid breaking or cracking pavement edge.
 3. After concrete has been given a preliminary finish by finishing devices incorporated in the slip-form paving equipment, surface of the fresh concrete to be checked with a straightedge to tolerances and finish required.

F. Concrete Placing and Handling - Wood or Metal Formed Curb: Curbing may be poured monolithic with pavement or may be added to pavement surface at a latter time. Place curb dowel bars while pavement is plastic. Provide expansion joint and contraction in curb opposite each expansion joint or contraction joint in pavement and at each curb inlet. Use same expansion joint material as used in pavement. Cut weakened plane joints with an approved grooving tool opposite each joint in pavement, as required. Apply finish coat of mortar on exposed surfaces of curb. Mortar composed of one part Portland cement and two parts sand. Apply mortar with a template or "mule" conforming to plan curb dimensions. Steel trowel finish all exposed surfaces of curb and brush to a smooth, uniform surface.

G. Concrete Placing and Handling - Machine-Laid Curb

1. Lay curbs by an extrusion-type machine. Immediately prior to placing of the curb, thoroughly clean the previously approved foundation.
2. Grade and alignment for top of curb to be as shown on Plans and/or Exhibits. The forming tube of the extrusion machine to be readily adjustable vertically during the forward motion of the machine, to provide required variable height of curb necessary to conform to the established grade line.
3. Feed concrete into machine in such a manner and at such consistency that the finished curb will present a well-compacted mass with a surface free from voids and honeycomb and true to established shape, line, and grade.
4. Perform any additional surface finishings specified and/or required immediately after extrusion. Construct joints as specified or as shown on Plans and/or Exhibits.

H. Finishing

1. Nonresidential Pavements: Finish concrete pavement by power-driven transverse finishing machines and longitudinal finishing machines. Provide transverse finishing machine with two screeds accurately adjusted to crown of pavement. Ride transverse finishing machine on forms, so designed and operated as to strike off and consolidate concrete. Make at least two trips over each area, or more if necessary. Provide longitudinal finishing machine with a longitudinal float not less than 10-feet in length, adjusted to a true plane. Ride longitudinal finishing machine on forms, so designed and operated as to finish pavement to required grade. Equip finishing machines with rubber tires to roll on concrete pavement. Just before concrete becomes non plastic, belt pavement surface with a canvas

or canvas-rubber composition belt of two-ply or four-ply construction, not less than 6-inches nor more than 10-inches wide, and at least 2-feet longer than width of pavement. Use short transverse strokes and rapid advance longitudinally to produce uniform surface of gritty texture.

2. Residential Pavements: Concrete pavement may be finished by machine or by hand. If by machine see Paragraph H1 above. If finished by hand thoroughly vibrate concrete around reinforcement and embedded fixtures. Tamp concrete with a tamping template made of 4-inch by 10-inch lumber or equivalent metal section at least 2-feet longer than width of pavement to conform to crown section of pavement. If wood tamping template is used it is to have a steel face not less than 3/8-inch in thickness. Strike off concrete with a strike-off screed made of 4-inch by 10-inch lumber or equivalent metal section at least 2-feet longer than width of pavement and conforming to crown section of pavement. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Use a longitudinal float not less 10-feet in length to level surface. Prior to concrete becoming nonplastic, belt pavement surface with canvas or canvas-rubber composition belt of two-ply or four-ply construction not less than 6 inches or more than 10-inches wide and at least 2-feet longer than width of pavement. Use short transverse strokes and rapid advance longitudinally to produce uniform surface of gritty texture.
3. Slip Form: If this method of construction is used all requirements of this Technical Specification in regard to subgrade and pavement tolerances, pavement depth, alignment, consolidation, finishing, workmanship, etc. to be met. Equip "slip form paver" with longitudinal triangular finishing float adjustable to crown and grade. Extend float across the pavement almost to the side form and/or the edge of slab.

I. Surface Tests

1. Test entire surface before initial set and correct irregularities or undulations to bring surface within requirements of following test, then finish.
2. Place approved 10-foot straight edge parallel to center of roadway so as to bridge any depressions and touch all high spots. Ordinates measured from face of straight edge to surface of pavement not to exceed 1/16-inch per foot from nearest point of contact, and in any case maximum ordinate to 10-foot straight edge to be no greater than 1/8-inch.

- J. Joints: Place joints of types shown on Plans and/or Exhibits at required locations and at spacing shown.
1. Construction Joints: Place transverse construction joint when necessary to stop concrete placement for period of more than 30 minutes. Length of slab to be not less than 10-feet from nearest joint of complete slab. If closer than 10-feet Contractor to remove concrete from between forms back to nearest normal joint and place construction joint at bulkhead. Use longitudinal keyed construction joints at pavement edges where required.
 2. Expansion Joints: Place expansion joint at radius points of curb returns for cross-street intersections, or as shown on Plans and/or Exhibits. Do not use boards less than 6-feet in length. When pavement is 24-feet or less in width, use not more than two lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross-section of concrete slab. Use premolded joint filler, accurately shaped, in curb section. Load transmission devices to be of type and size shown on Plans and/or Exhibits. Use joint sealing compound as required.
 3. Contraction Joints: Make straight and place at spacings shown on Plans and/or Exhibits. Place asphalt-coated smooth dowels accurately and normal to joint. Tool edges of groove and seal with joint sealing compound.
 4. Longitudinal Weakened Plane Joints: Form longitudinal weakened plane joint by an approved continuous metal shield or an asphalt impregnated felt strip placed continuously behind longitudinal float by a machine of the flex plane type.
- K. Protection and Curing: Following requirements apply on alternate methods of curing. Cover concrete with burlap or cotton mats when concrete has hardened sufficiently to prevent marring of surfaces and keep wet continuously for 72 hours. Apply curing compound immediately after free water has disappeared and at rate specified. Keep polyethylene sheets or membrane curing film in place and intact for five days in lieu of 72 hours of curing. Cure concrete curbs and gutters to prevent checking while setting. After each day's run barricade street. No wheeling will be allowed on concrete during curing period. Do not open pavement to traffic until concrete is at least 7 days old. Clean off pavement and seal joints before opening pavement to any traffic.
- L. Penalty for Deficient Concrete Pavement Thickness: It is the intent of this specification that the concrete pavement be constructed in strict conformity with the thickness and typical sections shown on the Plans and/or Exhibits. Where any such pavement is found not so constructed, the following rules relative to adjustment of payment for acceptable concrete pavement and to the replacement of faulty concrete pavement shall govern.

1. Pavement Thickness: The concrete pavement will be core drilled by a testing lab prior to final acceptance. The thickness of the pavement will be determined by measurement of the cores. At such points as the Engineer may select in each unit, one core will be taken for each 1000 square yards of concrete pavement, or fraction thereof, in the unit. However, a minimum of four cores are required for any pavement area. If the core so taken is not deficient more than 0.25-inch, full payment shall be made and the cores will be paid for by the Owner. If the core is deficient in thickness by more than 0.25-inch but not more than 0.5-inch, two additional cores will be taken from the area represented and the average of the three cores determined. If the average measurement of these three cores is not deficient more than 0.25-inch from the plan thickness, full payment will be made. If the average thickness of the three cores is deficient more than 0.25-inch, the sections having such deficiencies shall be removed and the concrete pavement shall be replaced to the specified plan depth.
2. No additional payment over Contract unit price to be made for pavement of thickness exceeding that required by Plans and/or Exhibits.
3. Additional 6-inch cores required to determine area of deficient thickness to be paid for by Contractor.

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ITEM 2526

CONCRETE CURB, GUTTER, CURB AND GUTTER

I. GENERAL

- A. This Item shall govern for curb, gutter, combined curb and gutter, with or without reinforcing steel, composed of Portland cement concrete constructed on approved subgrade, foundation material or finished surface in accordance with the lines and grades established by the Engineer and in conformance with details shown in Plans and/or Exhibits.

As used in this Item, the word “curb” refers to concrete curb, concrete gutter, and combined concrete curb and gutter.

- B. Related Work (if utilized in this project)
1. Item 3310 – Concrete
 2. Item 3200 – Concrete Reinforcement

II. MATERIALS

- A. Item 3310 – Concrete: Class as shown on Plans and/or Exhibits or in proposal.

- B. Reinforcing Steel

Item 3200 – Concrete Reinforcement: Bar size and type as shown on Plans and/or Exhibits.

- C. Expansion Joint Material

To be in accordance with section and location as shown on Plans and/or Exhibits.

1. Fillers
Pre-molded
2. Asphalt filler board per ASTM D994-71.
3. Pre-molded joint material per ASTM D17151-73.
4. Wood:

- a. Redwood: Boards shall be heartwood and shall be free from sapwood, knots, clustered birds-eye, checks, and splits. Maximum weight per cubic foot when oven dried to constant weight to be 30 pounds.
- b. Other Woods: Cypress, Gum, Southern Yellow Pine, or Douglas Fir Timber may be used with prior approval of the Engineer. With the exception of Cypress, all boards shall have a creosote or penta chlorophenol treatment of 6 pounds per cubic foot. Maximum weight per cubic foot when oven dried shall not be greater than 30 pounds per cubic foot.

D. Forms

1. Curbs

- a. Wood or Metal: Wood or metal curb forms to be of approved section, straight and free of warp. Outside curb forms to have a depth at least ½-inch greater than height of curb. Rigidly attach inside curb forms (if desired) to outside forms.
- b. Machine Laid: Equipment to conform to the requirements as specified under ARTICLE III EXECUTE. Use flexible or curved forms of wood or metal of proper radius for curves but not to exceed radius recommended by curb machine manufacturer.

E. Materials for Curbing

1. Burlap: Mats to be in good condition, clean and free of any substance which would have deleterious effect on concrete.
2. Cotton Mats: Mats to be in good, clean and free of any substance which would have deleterious effect on concrete.
3. Waterproof Paper: Per ASTM C171-69
4. Membrane Curing Compounds: Conform to ASTM C309-74.
5. White Polyethylene Sheeting: Sheet having thickness not less than 4 mils (.004-inch).

F. Grouting

1. Material and mixtures for grouting curb dowels.
 - a. Proportion by weight.
 - b. One part Portland cement, Type I or Type II.
 - c. One part clean, sharp sand.
 - d. Seven-tenths part non-shrinking grout aggregate.

- e. No more than 5½ gals. water per sack cement.
- 2 Other: Use mixture by weight of one part Portland cement and two parts sand for general purposes. If space to be grouted is less than 1-inch and is impossible to tamp grout, use one-to-one mix. Where space to be filled with grout is large, use original concrete mixture. Use stiff mixture for grout to be tamped, produced by prolonged mixing. To obtain stiff grout, mix mortar using amount of water required to thoroughly mix ingredients, then, continue mixing without additional water until grout is stiff enough to be compacted by tamping when placed. For grouting blockouts for embedded pipes and similar items, use grout to which 5 pounds of non-shrinking grout aggregate per sack of cement has been added.

III. EXECUTION

A. Subgrade

Excavate, shape and compact subgrade to grades, section, and densities shown on Plans and/or Exhibits. Maintain drainage of subgrade at all times. Test subgrade section with an approved template, operated and maintained by Contractor. Wet down subgrade sufficiently in advance of placing pavement. No pavers, batch trucks, or other equipment to be permitted between forms during paving operations.

B. Concrete Placing and Handling – Wood or Metal Formed Curb

Curbing may be poured monolithic with pavement or may be added to pavement surface at a later time. Place curb dowel bars while pavement is plastic. Provide expansion joint and contraction in curb opposite each expansion joint or contraction joint in pavement and at each curb inlet. Use same expansion joint material as used in pavement. Cut weakened plane joints with an approved grooving tool opposite each joint in pavement, as required. Apply finish coat of mortar on exposed surfaces of curb. Mortar composed of one part Portland cement and two parts sand. Apply mortar with a template or “mule” conforming to plan curb dimensions. Steel trowel finish all exposed surfaces of curb and brush to a smooth, uniform surface.

C. Concrete Placing and Handling – Machine-Laid Curb

1. Lay curbs by an extrusion-type machine. Immediately prior to placing of the curb, thoroughly clean the previously approved foundation.
2. Grade and alignment for top of curb to be as shown on Plans and/or Exhibits. The forming tube of the extrusion machine to be readily adjustable vertically curing the forward motion of the machine, to provide required variable height of curb necessary to conform to the established grade line.

3. Feed concrete into machine in such a manner and at such consistency that the finished curb will present a well-compacted mass with a surface free from voids and honeycomb and true to established shape, line, and grade.
4. Perform any additional surface finishings specified and/or required immediately after extrusion. Construct joints as specified or as shown on Plans and/or Exhibits.

D. Finishing

After the concrete has been struck off and after it has become sufficiently set, the exposed surfaces shall be thoroughly worked with a wooden float. The exposed edges shall be rounded by the use of an edging tool to the radius indicated on Plans and/or Exhibits. Unless otherwise specified on the Plans and/or Exhibits, when the concrete has become sufficiently set, the inside form for curbs shall be carefully removed and surface shall be plastered with a mortar consisting of one part of Portland cement and two parts fine aggregate. The mortar shall be applied with a template made to conform to the dimensions as shown on Plans and/or Exhibits. All exposed surfaces shall be brushed to a smooth and uniform surface.

For extruded concrete construction, the concrete shall be placed by an extrusion machine approved by the Engineer. When placement is directly on subgrade or foundation materials the foundation shall be hand-tamped and sprinkled if considered necessary by the Engineer. If the concrete is placed directly on the surface material or pavement, such surface shall then be coated with an approved adhesive or other coating as specified at the rate of application shown.

E. Surface Tests

1. Test entire surface before initial set and correct irregularities or undulations to bring surface within requirements of following test, then finish.
2. Place approved 10-foot straight edge parallel to center of curb so as to bridge any depressions and touch all high spots. Ordinates measured from face to straight edge to surface of pavement not to exceed $\frac{1}{16}$ -inch per foot from nearest point of contact, and in any case maximum ordinate to 10-foot straight edge to be no greater than c-inch.

F. Joints

Curbs, gutters, and curb and gutters shall be placed in sections of 50-feet maximum length unless otherwise shown on the Plans and/or Exhibits. Joints shall be constructed at such locations and of the type as directed and specified on the Plans and/or Exhibits.

- G. Protection and Curing: Following requirements apply on alternate methods of curing. Cover concrete with burlap or cotton mats when concrete has hardened sufficiently to prevent marring of surfaces, and keep wet continuously for 72 hours. Apply curing compound immediately after free water has disappeared and at rate specified. Keep polyethylene sheets or membrane curing film in place and

intact for five days, in lieu of 72 hours of curing. Cure concrete curbs and gutters to prevent checking while setting. After each day's run, barricade street. No wheeling will be allowed on concrete during curing period. Do not open pavement to traffic until concrete is at least 7 days old. Clean off curb and seal joints before opening pavement and curb to any traffic.

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ITEM 2555

WATER PIPING

I. GENERAL

- A. Scope: This section specifies furnishing and installing new water mains including valves, valve boxes, flush valves, blocking, fittings, and other appurtenances.
- B. Related Work (if utilized in this project)
 - 1. Item 2221 - Excavation, Trenching and Backfilling for Utilities
 - 2. Item 9901 - Painting and Coating

II. MATERIALS

- A. Ductile Iron Pipe
 - 1. Furnish ductile iron pipe manufactured in accordance with AWWA C-151/A21.50. Pipe to be of American manufacture. Ductile iron pipe to be of thickness class per Plans and/or Exhibits in accordance with AWWA C-150/A21.51. Manufacturer to furnish Certification of Compliance.
 - 2. Unless shown otherwise on Plans and/or Exhibits or required herein, push-on joints to be considered standard.
 - 3. Where Plans and/or Exhibits or specifications indicate cast iron fittings or ductile-iron fittings, the terms are to be considered interchangeable. Such fittings are to conform to AWWA C-110 for 200 psi working pressure. Joints shall be consistent with intended use as shown on drawing. Where no joint type is indicated in cast iron pipe runs, push-on is to be considered standard. Manufacturer to provide Certification of Compliance, “restrained” mechanical joints, to have welded ring on spigot, or other approved design.
 - 4. “Flanged and flanged” and “flanged and plain end” pipe shall be in conformity with AWWA C-115.
 - 5. All C.I. and D.I. pipe and fittings shall be furnished with cement-mortar

lining conforming to AWWA C-104-08, standard thickness.

6. All material to be approved by Underwriters' Laboratory and accepted without penalty by the Texas Fire Insurance Commission.

B. Steel Pipe

1. Provide steel pipe intended for use as underground carrier pipe, sizes 4-inches through 24-inches, conforming with AWWA C-200-12; 150 psi working pressure; cement-mortar lining per AWWA C-205-12.
2. Minimum wall thicknesses for carrier pipe must meet the following criteria:

Nominal Pipe Size <u>(Inches)</u>	Outside Diameter <u>(Inches)</u>	Minimum Wall Thickness <u>(Inches)</u>	LBS Per Lineal Foot, <u>Uncoated</u>
4	4.500	0.250	11.35
6	6.625	0.280	18.97
8	9.625	0.322	28.55
10	10.750	0.365	40.48
12	12.750	0.375	59.56
16	16.000	0.375	62.58
18	18.000	0.375	70.59
20	20.000	0.375	78.60
24	24.000	0.375	94.62

3. Furnish pipe with beveled ends for field butt welding.
4. Coat the pipe exterior in accordance with Item 9901 - Painting and Coating.
5. Furnish new and unused pipe manufactured in compliance with Underwriters' Laboratories, Inc. specifications, Steel Pipe Lines for Underground Water Service. Pipe must be acceptable, without penalty, to the Texas Fire Insurance Commission for use in water works distribution systems.
6. Where small diameter steel pipe is required, it is to be ASTM A-53 or 120, Schedule 40, galvanized.

C. Pre-tensioned Concrete Cylinder Pipe

1. Pipe scheduled for underground water main unless another material

specifically named, is to be reinforced concrete water pipe-steel cylinder type, pre-tensioned, conforming to AWWA C-303-08, unless shown otherwise on Plans and/or Exhibits. The concrete cylinder pipe is to also be approved by Underwriters' Laboratory and accepted by the State Fire Insurance Commission without penalty.

2. The manufacturer will be supplied all necessary data per Sec. 1.4 of said specification. He shall promptly submit, per Sec. 1.6 (C-303-08) detailed Plans and/or Exhibits and schedules and tabulated layout schedule. Each piece shall be marked thereon with an identification number, and each piece subsequently manufactured shall be so marked per Sec. 1.7 (C303-08).
3. Quality control test reports on steel, cylinder assembly, and concrete shall be submitted to the Owner through the Engineer. An Affidavit of Compliance shall be similarly provided.
4. The design working pressure of the pipe is to be 150 psi, the design transient pressure is to be 100 psi. The external loading condition is to be; Live Load-AASHO H20, Dead Load-30" cover to 15-feet saturated clay backfill; bedding as shown on details and described herein. Pipe to be considered rigid.
5. Joints, except where specifically otherwise designated to be compressed rubber "O" Ring" type. In general, thrust is to be transferred to earth by skin friction through tack-welded joints. All vertical fittings to be welded, as well as horizontal bends not noted on Plans and/or Exhibits as requiring blocking. Manufacturer to submit detail and incorporate in layout.
6. Flanges on steel cylinder pipe to conform to AWWA C-207-07, Class E, or ASA Series 150, flat-faced.
7. Spigot ends to match C.I. fittings to have O.D. matching cast iron.
8. All joints to be externally mortared in accordance with manufacturer's recommendations. All joints on 18-inch and larger to be internally mortared in accordance with manufacturer's recommendations.
9. Tapped or special connections to be mortared, no exposed metal pipe.

D. Polyvinyl-Chloride Pipe

1. PVC pressure pipe, 4-inch and larger diameter, to conform to AWWA C-900-07, or AWWA C-905-10, minimum 150 psi rated, elastomeric ring joints unless otherwise required.

2. PVC Pressure Pipe, 3-inch and smaller, is to conform to ASTM D-1785, and ASTM D-2241, Class 160. Class 160 in 1½-inch, 2-inch, and 3-inch diameters to have elastomeric seal joints, ASTM D- 3139. Smaller pipe to be solvent welded.
- E. Copper Tubing
1. Provide Type K copper tubing for underground service where required in ¾-inch, 1-inch, 1½- inch, and 2-inch sizes. The tubing to be Type K, soft-annealed, with proper bending temper.
 2. Tubing must meet requirements of ASTM B-88 and Federal Specification WW-T-799.
- F. Polyethylene Pipe
1. Polyethylene pipe and tubing, hereinafter called PE pipe or tubing, shall conform to AWWA C-901-08, PE 3408 material, Class 160.
 2. All coils of PE tubing shall be spirally wrapped in heavy water resistant paper or packaged in cardboard boxes. Each coil shall be labeled clearly to show the size, coil length and pressure rating of the tubing.
- G. Fittings for Service Connections: Provide brass fittings in conformance with AWWA C-800-12.
- H. Gate Valves: Resilient Wedge, NRS gate valves with iron body, fully encapsulated resilient wedge seats conforming to AWWA C-515-09. Valve ends to be of type indicated on Plans and/or Exhibits, or if not indicated, mechanical joint or hub or gasketed appropriate for the connecting piping. M.J. bolt holes to straddle centerline. Underground valves to be provided with 2-inch square operating nut, aboveground with handwheels. Stem seals to be “O” ring. Stem to turn counterclockwise to open. M.J. bolts to be cadmium plated.
- I. Butterfly Valves: Furnish butterfly valves for locations shown on Plans and/or Exhibits conforming to AWWA C-504-10. Valve ends to be short body flanged or mechanical joint as indicated on Plans and/or Exhibits. Valve to have stainless steel body seat and 360 degrees rubber seat on vane. Seat to be site replaceable. “O” ring shaft seal. Valves for underground locations to be fitted with manual underground operator, 2-inch square nut, opening counterclockwise. Above ground valves to be fitted with crank operator, opening counterclockwise. M.J. bolts to be cadmium plated. Manufacturer to furnish Certificate of Compliance.
- J. Flexible Component

1. Flanged Adapters: Up to 12-inches, to be Rockwell Type 912 or approved equal, larger than 12-inch diameter, to be Rockwell Type 913 or approved equal. For “lock” type furnish with locking studs for 12-inches and smaller; furnish harness assembly for larger adapters.
 2. “Dresser” Couplings: Cast couplings for cast iron pipe; Dresser Style 38, 53, 153 or Rockwell Type 43D series.
- K. Fire Hydrants: Fire hydrants shall meet or exceed the requirements specified in AWWA C502, latest revision, and shall comply with Factory Mutual Research Corporation and Underwriters’ Laboratories UL Standard 246. The minimum rated working pressure shall be 200 psi with a minimum test pressure of 400 psi. Hydrants shall comply with the following specific design criteria:
1. Main valve closure shall be compression type, opening against the pressure and closing with the pressure.
 2. Fire hydrants shall be traffic models, with breakable stem coupling. Traffic feature to be designed so the nozzle section of the hydrant can be rotated (by degree) to full 360 degree circle to face the nozzles in any direction. The internal hydrant rod shall be two piece, held together by a breakable coupling designed to snap upon vehicular impact. The hydrant barrel shall have a two piece breakable flange at the bottom of the upper barrel.
 3. The main valve opening shall not be less than 5¼-inch. Unit to be designed so removable hard rubber seat, drain valve mechanism, internal rod, and all working parts can be removed through the top of the hydrant. These parts shall be removable without disturbing the ground line joint or the nozzle section of the hydrant. The bronze seat shall be threaded into matching threads of bronze for ease of field removal.
 4. Hydrants shall be equipped with positive operating, non corrodible drain valves. The draining system shall be bronze and activated by the main stem without the use of an axillary rod, toggles, pins, etc. The drain mechanism shall be completely closed after no more than three turns of the operating nut in the opening direction. There shall be a minimum of two (2) inside ports and four (4) drain port outlets to the exterior of the hydrant. Drain shut-off to be direct compression closure. Sliding drain seals are not acceptable.
 5. Hydrant shall be a dry-top type. There shall be an internal top housing with triple O-rings to seal operating threads from the waterway and accommodate an anti-friction washer.

6. The operating nut and stem shall be capable of withstanding an input torque of 200 ft-lbs in opening or closing directions.
 7. Hydrant shall be equipped with sealed grease lubrication.
 8. Hydrant shall have two (2) 2½-inch hose nozzles and one (1) 4½-inch 4½TPI pumper nozzle. All nozzles to be NST 2½ 7.5 TPI. Nozzle section of hydrant to be designed to permit field replacement of damaged threads without special tools, excavation, or disturbing the ground joint. Bronze nozzles are to be locked into hydrant barrel with locking lugs and sealed by heavy duty O-ring. Each nozzle to be equipped with weather cap with 1½-inch operating nut. Hydrant shall be a minimum of 18-inches from ground line to center of hose nozzle.
 9. Hydrant to be equipped with 1½-inch operating nut. Direction of opening shall be counterclockwise, with appropriate markings plainly visible to so indicate.
 10. Hydrants shall have 6-inch M.J. shoe connection.
 11. Unless otherwise shown, depth of bury shall be 4-feet with a minimum weight of 500 pounds at this bury. Hydrants shall be designed to permit extension without excavation.
 12. Friction loss through hydrant shall not exceed 3.0 psi at 1000 gpm through pumper nozzle. Flow testing and certification of this feature shall be conducted by an independent testing laboratory and be in accordance with AWWA C502-05.
 13. Fire hydrants are to be Mueller or American Darling.
- L. Valve Boxes: Furnish 3-piece cast iron valve boxes, with base sizes to fit valve bonnet. Shaft shall be 5¼-inch diameter. Lids marked "WATER." All pieces shall be asphalt-dipped. For valves located outside of roadway, Tyler Series 6860 screw type or 6" (PVC SDR-26) with cast iron section A and LID, to be furnished. For valves located within roadway, Tyler Series 6865 slip type, or equal. Extensions of proper length to be supplied.

III. EXECUTION

- A. General: Except as required otherwise by these specifications or by Plans and/or Exhibits, piping is to be installed in accordance with the applicable provisions of the following:

1. Ductile cast iron water mains and appurtenances - AWWA C-600-10.
2. ASTM D-2321 - Recommended practice for underground installation of flexible thermoplastic pipe.

B. Pipe Handling

1. Pipe shipped to the job shall be properly protected against normal forces during transit from manufacturing site to project site.
2. Contractor shall provide and employ slings, lifting cables, strong backs, etc. as recommended by manufacturer in handling pipe, fittings and appurtenances on the job. Proper care against damage from rough handling shall be exercised at all times. Under no circumstances will pipe for fittings be dropped, nor will pipe be allowed to slam together.
3. Pipe is to be strung only on street right-of-way and easements; water pipe is never to be strung in drainage ditches. Strung pipe shall not be placed so as to prevent or unreasonably obstruct access of people or vehicles to residences or to businesses. Loose items such as joint assembly material are not to be left in street right-of-way. Delivery of piping materials is to be scheduled so that pipe is strung a maximum of 2 weeks prior to pipe laying.
4. Particular care is to be taken to avoid damage to pipe that is cement mortar lined.
5. Pipe will be strung so bells or belled couplings face in the direction of laying advancement.

C. Pipe Laying General

1. Use specified piping materials corresponding to the material, size, type, etc. indicated on Plans and/or Exhibits.
2. Do not lay pipe in water, or when trench or weather are unsuitable for work, except with permission of the Engineer. Keep water out of trench until jointing is complete. When work is not in progress, close ends of pipe and fittings securely so that no trench water, earth or other substance will enter pipes or fittings.
3. Keep the inside of the pipe free from foreign matter during operations by plugging or other approved method.
4. Place pipe so that the full length of each section rests solidly upon the pipe

bed, with recesses excavated to accommodate bells and joints. Take up and relay pipe when the grade or joint is disturbed after laying.

5. Locate no joints closer than 9-feet from sanitary sewers. Where possible, lay water lines 9-feet above sewers at crossings.
6. Where pipe ends are left for future connections, install valves, plugs or caps, as shown. Provide thrust blocking or joint restraint as necessary to prevent pipe or fitting movement.
7. Handle pipe and accessories so that all pipe placed in the trench is sound and undamaged. Take particular care not to injure pipe coating.
8. Cut cast iron neatly, using approved type mechanical cutter without damaging pipe. Cutting by cutting torch is strictly prohibited. Use wheel cutters when practical. Saw asbestos-cement and PVC with sharp saw with properly set teeth.
9. Before installation, inspect pipe for defects. Replace sections of pipe found to be defective, damaged or unsound.
10. Pipe barrels to be clean at time of joining. Swab as required to remove dirt, mud and other foreign matter.

D. Bedding and Pipe Placement: Refer to Item 2221 - Excavation, Trenching and Backfilling for Utilities

E. Joints

1. Make of joints generally to be in accordance with manufacturer's directions and referenced standards.
2. For pipes using a compressed elastomeric gasket joints, bell and spigot surfaces and gasket shall be clean. Area adjacent to gasket and gasket groove to be free of foreign particles. Spigot beveled as required. Gasket or spigot end lubricated per manufacturers directions. The two pieces to be joined are to be in axial alignment and restrained from rotating around the axis, until the pipe is "home." The position of the gasket is to be checked all around with a feeler gauge when so recommended, or other recommended checks made to insure proper gasket positioning, and/or pipe and end gap. Pipe ends are not to be butted. The force necessary to push the pipe "home" shall be closely controlled, applied in such a manner as not to displace nor damage piping being joined.
3. Mechanical joints and flexible couplings to be made up similar to "push"

joints. Pipe alignment to be within tolerance of joint. Gasket to positioned all bolts made up evenly using a torque wrench of the recommended rating, bolts and nuts positioned and tightened in every hole.

4. Flange Joints

- a. Flange faces to be clean. Pieces to be joined are to be in precise alignment and fit up to be snug without springing. Gasket to be carefully positioned and bolts pulled up evenly. Bolts or studs to be properly tightened in every hole. Closures shall not require pull up by bolting for fit. Special care to be taken at equipment, valve or fitting so that fit is good and flange makeup does not distort equipment.
- b. Use flat face companion flanges only with flat faced fittings, valves or equipment. Otherwise use raised face flanges.
- c. Install 1/16-inch asbestos gasket full-face excepting ring for raised face, suitable for intended service and factory cut to proper dimensions. Secure ring gaskets with a suitable gasket cement.
- d. Use ANSI nuts and bolts, galvanized or black to match flange material. Use cadmium plated nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets. Joints to be water tight.
- e. Keep flange covers on equipment and shop-fabricated piping until ready to install in system.

5. Plastic

- a. When using threaded joints provide sharp, clean pipe dies and Teflon thread tape. Make joints in strict accordance with manufacturer's recommendation.
- b. When gluing PVC, use solvent cement method in strict accordance with manufacturer's recommendations, and ASTM D- 2241. Allow proper drying time.
- c. Compressed elastomeric joints to be made up in accordance to manufacturer's recommendations.

F. Joint Deflection: Joint deflection shall in no case exceed the manufacturer's

recommendations. Push-on type joints shall have deflections taken only after pipe is “home.” Mechanical type joints to be deflected prior to final tightening.

G. Thrust Resistance

1. Responsibility of thrust resistance shall be the responsibility of the Contractors.
2. Thrust blocking shall be provided at all fittings. The concrete shall bear on undisturbed firm soil. If unavailable at a particular installation, the absence shall be promptly brought to the Engineer’s attention. Place concrete so that joints are left accessible.
3. Restrained Joints: Where flexible joints are shown as “lock” or “restrained,” resistive restraint devices capable of being dismantled and with ample ability to transfer the thrust shall be engaged so as to positively prevent pipe separation.

H. Underground Protection, Cast and Ductile Iron

1. Where indicated on the Plans and/or Exhibits underground ductile and cast iron shall be wrapped in polyethylene film in accordance with AWWA C-105.
2. Where indicated on the Plans and/or Exhibits underground metal piping shall be cathodically protected.

I. Setting Underground Valves, Valve Boxes, and Flushing Valves

1. Prior to installing valves or flushing valves, remove foreign matter from within the valves. Inspect the valves in open and closed positions to verify that all parts are in satisfactory working condition. Refurbish existing valves to be used again, installing new seats and seals and generally repair the valves. Install fully closed.
2. Install valves, valve boxes, and flushing valves where shown or as located by the Owner. The gate valves and flushing valves plumb and as detailed on Plans and/or Exhibits. Set butterfly valve with shaft true horizontal. Center valve boxes on valves. Locate valves away from roads or streets. Carefully tamp earth around each valve box for a minimum radius of 4-feet or to undisturbed trench face if less than 4-feet. Set flushing valve 2-feet from the edge of the right-of-way, such that connecting pipe will not have less cover than distributing mains.
3. Place a concrete thrust block opposite pipe connections, set against the

vertical face of the trench to prevent the valve from moving. If the character of the soil is such that the flushing valve cannot be securely wedged in this manner, provide bridle rods and rod callars of not less than 3/4-inch stock protected by a coat of acid- resisting paint.

4. Place pea gravel around the base of flushing valves to ensure drainage. Compact backfill thoroughly around the valve to grade line.
 5. Valve boxes to be set vertical, with bases of proper size fitted over valve bonnets, slip type boxes to be used where box exposed to traffic. Boxes to be set with tops flush with finish grade. Slip type box top-piece shall not be on step. Backfill to be tamped around box to ensure stability of its placement.
- J. Service Connections: Tubing to be made up slack in trench, free of kinks and crimps. Minimum radius for bends to be 12D. No connectors permitted under pavement. Connections to meter not to disturb or distort meter setting. Service piping to generally slope toward meter. Minimum cover under drainage ditches to be 18-inches. Where direct taps to the main are made, the tapping machine is to be secured on the main so that it does not wobble during drilling and tapping. Dies are to be sharp, and for tapered thread (Mueller). Where a service saddle is required; the saddle is to be securely tightened and a clean hole drilled in the main. Position the tap as indicated in the Plans and/or Exhibits. Corporation stops are to be made up tight and leakproof. The service line shall be kept clean at all times. Flaring shall be accomplished by the use of suitable flaring tools. Remove all burrs. All fittings shall have the proper "bite" on the tubing and be made tight. Tap to be perpendicular from main to meter box, or as near thereto as permitted by the joint. In general, taps to be made on new main at time of laying, (i.e. dry). Main to be flushed, disinfected and hydrostatically tested, then service tubing run. Prior to final connection to existing service or to meter or to existing service or to stop for future meter installation, service is to be thoroughly flushed. This is to be done through a large hose or pipe to drain into ditch or gutter, and including the stop, if any. Service tubing to be bedded and backfilled as per Item 2221 - Excavation, Trenching and Backfilling for Utilities.
- K. Hydrostatic Testing and Disinfection Sequence: New sections of main being installed in many cases will be tied in one or more places to valves separating the new main from the operating system. In all instances, unless approved in writing by Engineer prior to testing, a zone of atmospheric pressure will be maintained between existing main and newly constructed main until new main has been disinfected and accepted. In most instances, use of temporary valve assemblies will permit hydrostatic testing to promptly follow main line completion of section, without the danger of pumping contaminated water back into the operating system through a leaking valve. In case that the particular circumstances do not permit effective isolation, the Contractor shall be obliged to reverse the usual order and

disinfect the new mains first, then hydrostatically test, redisinfect after any rejoins.

- L. Hydrostatic Test: After each section of main is complete and can be isolated so high pressure cannot force test water into the operating system, it shall be hydrostatically tested. Such testing shall be in conformance with Section 4 of AWWA C-600, as modified herein:
1. Test section to be first flushed with open bleeds with flow controlled at feed from operating system so that flushing pressure is always well below operating system.
 2. Pressure Testing: Pressure testing should be done when the trench is only partially backfilled to allow for repairs if necessary. The operator should follow this procedure:
 - a. The pressure test should be performed after the main has been full of water for 24 hours. When filling the main, water should be admitted slowly to expel all air.
 - b. Pressure should be obtained and maintained by pumping water into the line through a meter. Test pressure should be 1½ times as great as the normal operating pressure or 150 psi, whichever is greater.
 - c. After two hours at test pressure, the leakage should be within limits for that type of line.
 3. A test, to be successful, must be witnessed by the Engineer's field representative, minimum 2 hours in duration and conducted during reasonable hours.
 4. The Contractor is to furnish all necessary equipment and calibrate to approved standards.
 5. Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD (P^{1/2})}{133,200}$$

in which L is the allowable leakage, in gallons per hour; in feet S is length of pipe line tested; D is the nominal diameter of the pipe in inches; and P is the average test pressure during leakage test, in pounds per square inch gauge. Allowable leakage is determined from Table 6A, AWWA C-600.

6. In case of failure, the Contractor shall find and repair the leaks until the

test section meets the minimum requirements.

7. When temporary inserts for hydrostatic testing are installed, upon removal the replacement piping shall be left exposed for visual inspection for leakage under normal pressure (after disinfection), before being backfilled.
8. The Owner will provide flushing and testing water only one time at no cost to Contractor. All retest costs, where additional water is required, will be borne by the Contractor. The Owner will, at Contractor's option, allow reimbursement or deduct these costs from the final estimate.

M. Disinfection: Disinfection for each section of the work shall be performed in accordance with AWWA C-651, as supplemented and modified below:

1. The Contractor shall provide taps within a few feet of the ends of the disinfection section and bleed so as to insure high strength solution to all parts of the section.
2. Unless otherwise approved, hypochlorite shall be used to supply the available chlorine.
3. Continuous feed methods to be used. The Owner will furnish the water one time only at no cost. The Contractor shall provide the chlorine solution tank and means of approximately proportioning its flow. Piping from hydrants of the dilutant water and all other piping and appurtenances to be furnished by the Contractor. Contractor to perform the disinfection and subsequent flushing.

All retest costs, where additional water for biological testing is required, will be borne by Contractor. Owner will, at Contractor's option, allow reimbursement or deduct from final estimate these costs.

4. The strong chlorine solution must be flushed from the test section. The Contractor shall provide means to discharge into an open drainage ditch or, into a mixing box discharging to storm sewer. The flushed chlorine solution must not be a potential cause for environmental damage. Contractor must neutralize thoroughly any remaining chlorine residual within the water. Where applicable, Federal, State, and Local Regulatory Agencies must be contacted to determine special requirements for disposal of heavily chlorinated water.
5. The Owner will cause bacteriological samples to be taken and tested. If negative for coliform organisms, the Contractor may proceed with the next step of the work; otherwise the disinfection procedure is to be repeated.

6. The Contractor may place tablets in the main for his benefit, but such is not to be a substitute for the above procedure.

N. Wet Connection

1. Wet connections are to be made under the direction of the Engineer and in such a manner and at such hours as to least inconvenience the public. Notify Project Manager at least 72 hours in advance of making connections. Conduct connection operations when inspector is at job site. When the existing mains have been cut or a plug removed for a connection, then the work or making the connection shall progress without interruption until complete. The compensation for making wet connections will be based on the unit bid prices and no additional compensation will be granted for making connections at night or for having to complete a connection under unfavorable working conditions.
2. No compensation will be given for extra work or for damages occurring as result of incomplete shutoff.
3. Wet connections consist of isolating sections of pipe to be connected with existing valves, draining isolated sections, and completing connections. Tapping sleeve and valves, and service connections are **not** wet connections.

ITEM 2560

SANITARY SEWERS

I. GENERAL

- A. Scope: This section specifies furnishing and installing sanitary sewer pipes, manholes, and appurtenances.
- B. Related Work (if utilized in this project)
 - 1. Item 2221 - Excavation, Trenching and Backfilling for Utilities
 - 2. Item 2224 - Encasing, Augering and Tunneling

II. MATERIALS

- A. Pipe
 - 1. Vitriified Clay
 - a. Clay pipe shall conform to ASTM C700, extra strength. Pipe wye, tee and bend fittings shall be of the same strength as the adjacent joint of pipe and shall also conform to ASTM C700. The clay pipe shall be free of fractures, cracks, chips and etc.
 - b. Joint closures shall be in accordance with ASTM C425.
 - c. Joint lubricant shall be in accordance with the pipe manufacturer's recommendations.
 - 2. Polyvinyl Chloride (PVC)
 - a. The plastic pipe and fittings shall meet the requirements of ASTM D3034, F949 or D2680, and the pipe shall have a minimum of 46 psi pipe stiffness when tested in accordance with ASTM D2412 and be of the nominal pipe size shown on the Plans and/or Exhibits. All PVC pipes shall be made of resins meeting ASTM D1784 cell classifications 12454B or 12454C.

- b. The Contractor shall furnish manufacturer's certification that the pipe and fittings furnished to the project meet the ASTM requirements above.
 - c. Pipe and fittings shall be free from defects which, in the judgment of the Engineer, would hinder their ability to function as planned.
 - d. The dimensions of the PVC pipe shall be as shown on the Plans and/or Exhibits. The fittings supplied shall properly fit the pipe supplied and shall be the same color as the pipe.
 - e. Gaskets: Compression-type vulcanized high grade elastomeric compound gasket joints as per ASTM Specification D1869 or D3212.
 - f. Lubricant: Lubricant used for assembly to have no detrimental effect on gasket or pipe and to be according to pipe manufacturer's recommendations.
3. Hobas (Centrifugally, Cast, Fiberglass-Reinforced)
- a. All pipes, joints and fittings shall be manufactured in accordance with the requirements of ASTM D3262. Pipes shall be centrifugally cast, fiberglass-reinforced polyester resin as manufactured by Hobas USA, Inc. Contractor shall furnish manufacturer's certification that the pipe and fittings furnished to the project meet the ASTM requirements above. Minimum pipe stiffness when tested in accordance with ASTM D2412 shall be 46 psi.
 - b. The Manufacturer shall use only approved polyester resin systems for which he can provide a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product. The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade of E-glass filaments with binder and sizing compatible with impregnating resins. Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
 - c. Pipe outside diameters shall be in accordance with AWWA Standards C151 and C950. For diameters larger than covered in those documents, OD's shall be approved by Engineer. Pipe shall be supplied in nominal lengths of 20-feet. Actual laying length shall be the nominal \pm 2 inches. At least 90% of the total

footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.

- d. Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain joint water tightness. The joints must meet the performance requirements of ASTM D4161.

4. High-Density Polyethylene Pipe (HDPE)

- a. HDPE shall be produced from a high density, high molecular weight polyethylene pipe material meeting the requirements of type III, Class C, Grade P34, as defined in ASTM D1248. The pipe shall have a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412.
- b. The Contractor shall furnish manufacturer's certification that the pipe and fittings furnished to the project meet the ASTM requirements above.
- c. The pipe shall be manufactured by the continuous winding of a special profile onto suitably sized mandrels. It shall be produced to constant internal diameters with a ring stiffness of 46 psi in accordance with ASTM F714. Standard shipping lengths shall be 20-feet, long, \pm 2-inches.

Each pipe length shall be clearly marked. Marking information shall include pipe size, profile number and production code.

The pipe shall be free from visible cracks, holes or other defects. It shall be as uniform as commercially practical in color, density and other physical properties.

- d. Joints: The pipe shall be produced with bell and spigot end construction. Joining will be accomplished by rubber gasket as determined in accordance with manufacturer's recommendations.

B. Manholes

1. Covers: Covers shall conform to ASTM 498-76, Class No. 30 cast iron. Make cast iron manhole frames and covers to dimensions shown on standard detail drawing. Castings free from sand or blow holes and other defects. Holes in cover to be free from plugs and burrs. Machine bearing surfaces of manholes, frames and covers to obtain even bearing. Cast

wording "Sanitary Sewer" or "Storm Sewer" as applicable; and name of Owner on cover as shown on standard detail Plans and/or Exhibits.

2. Precast Concrete

- a. Design Loads: Design loads shall consist of dead load, live load, impact and in addition loads due to water table and any other loads which may be imposed on the structure.

Live load shall be H-20 and/or H-20-S16 per the AASHTO Standard Specifications for Highway Bridges, with revisions. Design wheel loads shall be 16 kips. The live load shall be that loading which produces the maximum shears and bending moments in the structure.

- b. All cement shall be Portland cement conforming to ASTM C150. Cement content shall be sufficient to produce minimum compression strengths of 4,000 psi in 28 days.
- c. Reinforcing steel shall be in accordance with the Item 3200 - Concrete Reinforcement. Reinforcing steel shall be Grade 60. The minimum steel requirement in the walls and cone of a cast-in-place manhole will be one or two lines of steel, the total area per vertical foot shall be not less than 0.0025 times the inside diameter in inches. The steel requirement in the base section shall have a minimum area of 0.12 square inches per linear foot in both directions.
- d. Precast concrete manhole sections (base sections, risers, reducers, cones, slab tops, and grade rings) to conform to the requirements of ASTM C478. Provide bases, risers, and reducer sections having an inside diameter of 48-inches, 60-inches, 72-inches or 96-inches as shown on the Plans and/or Exhibits and details as required. The inside diameter of the access opening to be not less than 30-inches.
- e. The precast concrete manhole riser sections, excepting grade rings, to be formed with male and female ends for use with O-ring gaskets. The male end to contain a recess for the gasket. The joints and gaskets in the base and riser sections to comply with the requirements of ASTM C443.
- f. The adjustment throat rings to be reinforced concrete rings having a thickness of 3-inches. The internal diameter to be not less than 30-inches and the width to be a minimum of 5-inches.

- g. Resilient connectors for a watertight seal between precast concrete manholes and sewer pipe to be furnished of size and at location shown on the Plans and/or Exhibits. Resilient pipe to manhole connectors to conform to ASTM C923. Connectors to be embedded in the walls of precast concrete manhole sections. Resilient connectors to provide 10 degrees of omnidirectional deflection at the entrance of the pipe into the manhole wall. A-Loc Products or equal.
 - h. Flexible, watertight connector installed in formed holes with a compression ring. Connector to have take up clamp on gasket for mechanical compression on pipe. Press Seal Gasket or equal.
3. Fiberglass
- a. Design loads: Same as presented in B. 2. a above.
 - b. Fiberglass manholes shall be mounted on precast concrete base meeting the requirements of B. 2 including gasketed pipe penetrations. Seal (make watertight) joint between concrete and fiberglass with Ram-nek, Volclay, or Synko Flex.
 - c. Fiberglass riser shall conform to material requirements of ASTM D3753.

C. Sewer Line Specials

- 1. Sewer line specials are sewer line appurtenances, such as; cleanout, deep cut connections for service lines, branch wye outlets for service lines, and wye outlets on deep cut connections.
- 2. Pipe and Fittings: Use pipe and fittings constructed of same material as specified for main sewer.
- 3. Cast Iron for Castings: Conform to ASTM A48, Class No. 20, gray cast iron.
- 4. Concrete for Blocking and Encasing: 1500 psi, 28 day compressive strength. Material and mix in accordance with applicable specification Item.

III. EXECUTION

A. Pipe

1. Vitrified Clay

- a. Installation: Clay pipe shall be installed in accordance with ASTM C12, titled "Standard Practice for Installing Vitrified Clay Pipe Lines." Before laying pipe, prepare pipe ends by wiping the inside surface of bell or coupling and the outside surface of the spigot until clean and dry and apply joint lubricant in accordance with the manufacturer's recommendations. Cover the entire area with joint lubricant, then complete joint immediately.
- b. The pipe joint shall be made in the following manner. Push the spigot end into the bell of the preceding pipe until it is properly seated. Apply moderate force by using a simple lever. Two or three joints may be joined on the bank and then lowered into the trench.
- c. See detail sheet, Item 2221 - Excavation, Trenching and Backfilling for Utilities for bedding and backfill procedures, conform to ASTM C12.

2. Polyvinyl Chloride, Hobas, and HDPE

- a. Backfill in Pipe Zone: Install pipe and fittings in accordance with ASTM Specification D2321 except as shown on detail sheet, Item 2221 - Excavation, Trenching and Backfilling for Utilities. Note: **Initial backfill over pipe to be 12-inches in all cases.** Avoid contact between pipe and compaction backfill equipment. Compaction of haunching, initial backfill, and backfill material should be done in a manner that compaction equipment is not used directly above pipe until sufficient backfill has been placed to ensure that equipment will have no damaging effect on pipe.
- b. Joining: Use elastomeric gasket joints, providing a watertight seal. Assembly of joints to be per the manufacturer's recommendation.
- c. Connections to Manholes and Other Rigid Structures: Manhole couplings corresponding to size of sewer pipe to be cast directly into a rigid structure such as manhole or manhole base.
- d. Deflection Tests: All pipe to be satisfactorily tested for deflection by pulling a mandrel through pipe after backfilling is complete.

Mandrel to have an outside diameter equal to 95 percent of the original inside diameter of pipe being tested. See Item 2221 - Excavation, Trenching and Backfilling for Utilities for Mandrel requirements. Mandrel to be pulled by hand line. Should mandrel meet any resistance. Contractor may clean line and repeat test. Any pipe not meeting this test to be removed and replaced at Contractor's expense.

B. Manholes

1. Precast Concrete

- a. Precast concrete manhole bases to be bedded on a minimum of 8-inches of cement-stabilized sand or crushed aggregate as used for pipe bedding. The dimensions of the bedding to be 12-inches greater than the precast manhole base in all directions. The bedding to be placed to provide a firm foundation for the manhole. Contractor to level and plumb the base section prior to setting the manhole riser sections on the precast concrete base.
- b. All invert channels are to be constructed and shaped accurately so as to be smooth, uniform, and cause minimum resistance to the flow. The bench to be furnished smooth, with a slope of 1/2-inch per foot from the manhole walls to the edges of the invert channel.
- c. Sewer Pipe joints **not** to be cast or constructed within the wall sections of manholes.
- d. Gasket and pipe surface at resilient pipe to manhole connections to have a smooth, clean finish. Clean and lubricate pipe end a minimum of one-half the pipe diameter in length with a lubricant suitable for use with rubber O-ring concrete pipe joints. Lubricate the entire portion of the pipe which will slide through the resilient connector. If pipe is cut, no sharp edges to be allowed. A slight bevel is preferred as a lead and this should also be lubricated. No mortar to be placed around the connector on the outside of the structure and no mortar to be placed around the top half of the connector on the inside when completing the invert.
- e. Install stub-outs, where shown, to line and grade. Use one full joint of pipe, of size indicated, for stub-out. Seal stub-out with plug. Install plug in such manner as to prevent seepage of leakage through stub-outs. Install plugs such that it may be easily removed in future without damaging bell or groove end of stub-out.

- f. Where inlet leads, lateral sewer pipe, stub-outs, and drop connections enter manholes, cut off ends of protruding pipe flush with inside of manhole wall.
- g. Where drop connections into manholes are required, construct drops of 6-inch pipe for 6-inch sewer lines, of 8-inch pipe for sewers 8-inches in diameter through 15-inches in diameter, and of 12-inch pipe for all larger sizes of sewer lines. Drop connections consist of tee in sewer line faced vertical down, riser stack, 90-degree cut elbow at base of stack and joint of pipe from elbow into manhole. Encase entire drop connection in Class "B" concrete extending at least 4 inches outside of bells on 3 sides away from manhole wall and extending to face of manhole wall on side adjacent to manhole. Join entire drop connection with wall of manhole in solid mass of concrete. Construct drop connection at time manhole is constructed. If lateral is not to be immediately connected into drop connection, plug outer end of tee in same manner as specified for plugging stub-outs.
- h. Backfill - Place material in uniform layers of prescribed maximum thickness and wet or dry the material to no less than 3 percent below or more than 5 percent above optimum moisture content. Compact with power driven hand tampers to prescribed density. Laboratory field tests shall be taken at Engineers discretion. Either of the following backfill materials may be utilized at Contractors option:
 - 1) Select Material: Material selected from excavation, or obtained from other sources, shall be free from stones (which interfere with compaction) and free from large lumps (which do not breakdown readily under compaction). Place in 8-inch maximum layers, loose measure. Mechanically compact to not less than 95 percent of maximum soil density.
 - 2) Cement Stabilized Sand: Material to be in accordance with Specification Item 2221 - Excavation, Trenching and Backfilling for Utilities. Place in loose 8-inch thick layers and compact to a density of not less than 92 percent nor greater than 98 percent.

2. Fiberglass

- a. Construct base in accordance with provision of paragraph B. 1. a. through B. 1. d. Contractor to level and plumb the base section

prior to setting the fiberglass riser section on the precast concrete base.

- b. Base and riser to have joint made water tight. Joint material to be placed between the base and riser both inside and outside of joint. Joint seal to be Ram-nek, Volclay, or Synko-Flex.
- c. Backfill - Fiberglass manholes to be backfilled with cement stabilized sand (Specification Item 2221 - Excavation, Trenching and Backfilling for Utilities) a minimum of 3' - 0" from outside of the manhole or from outside of manhole to undisturbed soil, whichever is less. Backfill shall be from the bottom of the concrete base to the top of the manhole. Place in loose 8-inch thick layers and compact to a density of not less than 92 percent nor greater than 98 percent.
- d. Backfill around manholes and drop connections immediately after mortar and concrete, if applicable, have set. Place backfill in accordance with applicable Item.

C. Sewer Line Specials

- 1. Install wye and tee branches as sewer line is laid at locations shown or as directed. Correct omission of required specials during construction of sewer, at no extra expense to Owner. Do not cover specials until their locations have been recorded. Do not install permanent plugs in ends of branch openings or service lines until after a satisfactory exfiltration test is performed.
- 2. Installation of Branch Wye Outlets: Where ordered or shown, place branch wyes in pipe sewer at time pipe is laid. Unless Plans and/or Exhibits show service line to be constructed in this contract, plug branch opening with standard pipe plug. Install plug in such manner that will facilitate its future removal without damage to bell.
- 3. Installation of Deep Cut Connections: Unless otherwise directed, install deep cut connections only at locations where top of sewer is greater than 8-feet below surface of ground. Place tee in pipe sewer at base of deep cut connections at time pipe is laid and encase tee in concrete. Install C bend in branch opening tee. Install wye in bell of 1/8 bend if wye will raise height to within 5 to 8-feet of ground surface. If wye does not provide sufficient height, install run of pipe vertically between 1/8 bend and wye. Plug run of wye. Unless Plans and/or Exhibits show service lines to be constructed in this contract, plug branch opening with standard pipe plug. Install plug in such manner that will facilitate its future removal without

damage to bell. Encase deep cut connection in concrete in conforming with details shown.

4. Cleanouts: Install cleanouts at locations indicated and in conformity with details shown.
5. Service Line: Install service lines, when shown on Plans and/or Exhibits, from branch opening of fitting is sewer to property line. Terminate service line with hub. Install standard pipe plug in hub in such manner that will facilitate its future removal without damage to bell.

IV. QUALITY ASSURANCE

- A. Testing Requirements: Contractor to furnish water and all testing equipment unless specified otherwise.
- B. Testing Procedures
 1. Testing of Installed Pipe: An infiltration, exfiltration or low-pressure air test shall be as specified below. Copies of all test results shall be made available to the executive director upon request. Tests shall conform to the following requirements:
 - a. 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 2-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 2-feet above the crown of the pipe at the upstream manhole, or at least 2-feet above existing groundwater level, whichever is greater. For construction within the 25 year flood plain, the infiltration or exfiltration shall not exceed 10 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.
 - b. 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:

$$T = 0.085 \{DK\} \text{ OVER } Q$$

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

K = 0.000419HDHL, 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 for 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

above 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 10 seconds.

- c. 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 executive director shall be used to test for vertical deflections. Other methods shall provide a precision of \pm 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 five percent. 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.
- 1) 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 thicknesses 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.
 - 2) Mandrel Design: The rigid mandrel shall be constructed of a metal or a 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. See Item 2221 - Excavation, Trenching and Backfilling for Utilities, Page 14 of 15 for typical mandrel.

- 3) 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.
2. Manhole 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 commission. If a manhole fails a leakage test, the manhole must be made water tight and retested.
- a. Hydrostatic Exfiltration Test
 - 1) 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.
 - 2) 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.
 - 3) For concrete manholes a wetting period of 24 hours may be used prior to testing in order allow saturation of the concrete.
 - b. Vacuum Test
 - 1) After completion of manhole construction, but prior to backfilling, test manholes for water tightness using vacuum testing procedures.
 - 2) No grout shall be placed in horizontal joints before testing.
 - 3) Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled.

4) Vacuum Testing

- a) Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure; do not over-inflate.
- b) Manholes to be vacuum tested shall have 10-inches of mercury applied to the manhole and the time measured for the vacuum to drop from 10-inches to 9-inches of mercury. Vacuum equipment shall be approved by the Engineer prior to its use. Following are minimum allowable test times for manhole acceptance at the specified vacuum drop.

Depth of Manhole (feet)	Time (sec)		
	Manhole Diameter (inches)		
	<u>48"</u>	<u>60"</u>	<u>72"</u>
8	14	18	23
10	17	23	28
12	21	28	34
14	25	32	40
16	28	37	45
18	32	41	51
20	35	46	57
22	39	51	62
24	42	55	68
26	46	60	74
28	49	64	80
30	53	69	85

Test times for structures other than manholes will be based on the times for manholes of the nearest equivalent volume or as directed by the Engineer.

- c) If the drop in vacuum exceeds 1-inch mercury (Hg) over the specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

ITEM 3200

CONCRETE REINFORCEMENT

I. GENERAL

- A. Scope: This section gives requirements for concrete reinforcement. Coordinate the requirements of this section with all other items dealing with concrete and concrete construction.
- B. Reference Standards: The latest editions of reference standards listed below form a part of this specification and are applicable to this project.
1. American Society for Testing and Materials

ASTM A 615, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"

ASTM A 185, "Specification for Welded Steel Wire Fabric for Concrete Reinforcement"

ASTM A 306, "Specification for Carbon Steel Bars Subject to Mechanical Property Requirements"
 2. American Concrete Institute

ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures"

ACI 318, "Building Code Requirements for Reinforced Concrete"
 3. Concrete Reinforcing Steel Institute

CRSI 163, "Recommended Practice for Placing Reinforcing Bars"

CRSI 165, "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature"

C. Submittals

1. Certificates: Submit the manufacturer's certificates giving the properties of steel proposed for use. List the manufacturer's test number and heat number, chemical analysis, yield point, tensile strength and percent elongation. Also identify on the certificates the proposed location of the steel in the work.
2. Bill of Materials: Submit bills of materials to be reviewed with shop drawings.
3. Shop Drawings
 - a. Submit shop drawings according to the General Conditions. Show reinforcement fabrication, bar placement, location splices, spacing and bar designation, bar type, length, size, bedding, number of bars, location of bars to accommodate post-tensioning tendons and other pertinent information, including dimension. Information must correspond directly to data listed on the bill of materials.
 - b. Provide sufficient detail to permit placement of reinforcement without use of design Plans and/or Exhibits. Reproduction of design Plans and/or Exhibits for use as shop drawings will not be allowed. Begin fabrication of reinforcing steel after shop drawings have been reviewed by the Engineer.
 - c. Refer to ACI reference standards for detailing, location, placing, splicing, etc. of reinforcing steel to be shown on shop drawings.
 - d. Scheduling: Schedule materials for delivery to the site so that items may be installed immediately upon delivery. Plan the schedule to accommodate other work especially post-tensioning. Place items in the proper sequence so that removal and replacement to accommodate other work is avoided.
 - e. Handling and Storage: Store steel reinforcement above the ground on platforms, skids or other supports. Protect reinforcing, as far as practicable, from mechanical injury, surface deterioration and rusting caused by exposure to the weather.
 - f. Inspection: Make storage and fabrication facilities of the supplier and fabricator available for inspection by the Engineer prior to and during fabrication.

- g. Measurement and Payment: No separate payment. Include cost of work in applicable contract price.

II. MATERIALS

A. Reinforcement

1. Deformed Bars: Use deformed bars conforming to ASTM A 615, grade as specified on Plans and/or Exhibits, for all bars except column spirals and those shown on Plans and/or Exhibits to be smooth bars. Where grade is not specified on Plans and/or Exhibits, use Grade 60.
2. Smooth Bars: Use bars conforming to ASTM A 306, Grade 70, for all smooth bars including column spirals.
3. Marking: Clearly mark all bars with waterproof tags showing the number of bars, size, mark, length and yield strength. Mark steel with the same designation as the number in which it occurs. Key marks to be the concrete placement number as designated in the concrete placement sequence shown on the Plans and/or Exhibits.
4. Welded Wire Fabric: ASTM A 185, electrically-welded wire fabric of cold-drawn wire. Provide gauge and mesh size as shown.

B. Mechanical Bar Splices

1. G-Loc Splices: As manufactured by Gateway building Products, 3233 W. Grand Avenue, Chicago, Illinois, or approved equal.
2. Cadweld Splices: As manufactured by Erico Products, Inc., 2070 East 61st Place, Cleveland, Ohio, or approved equal.

C. Tie Wire: Use 18 gauge annealed steel for tie wire.

D. Accessories: Provide chairs, riser bars, ties and other accessories made of plastic or metal, except as otherwise specified. Where concrete surfaces are exposed to the weather in finished work, provide plastic accessories only. Use of galvanized or plastic tipped metal is not permitted in these locations. Use plastic accessories manufactured by W.H.C. Products, Inc., Houston, Texas, or approved equal.

E. Precast Concrete Bar Supports: Provide bar supports 3-inches wide, 6-inches long, and thick enough to allow the required cover. Embed tie wires in the 3-inch sides.

III. EXECUTION

- A. Notification: Notify the Engineer at least 24 hours before concrete placement so that reinforcement may be inspected and errors corrected without delaying the work.
- B. Fabrication
1. Cold Form Bent Bars: Fabricate cold-form bent bars to the shapes shown on the Plans and/or Exhibits. Do not straighten or rebend bars without specific approval. On the job, cut bars by shearing or sawing.
 2. Splices: Use a minimum number of splices. Lap splices in strict accord with ACI 318 or as shown. Where it is necessary to splice reinforcement other than shown, the Engineer will determine the character of the splice. Do not make splices at points of maximum stress. Stagger splices in adjacent bars.
 3. Fabrication Tolerances: Bars used for concrete reinforcement must conform to the following fabrication tolerances:

<u>Measurement</u>	<u>Tolerance in Inches</u>
Sheared length	+ - 1
Depth of truss bars to 8-Inch Depth	+ 0, - 1/4
Depth of truss bars over 8-Inch Depth	+ 0, - 1/2
Stirrups, ties, and spirals	+ - 1/4
All other bends	+ - 1

ITEM 3310
CONCRETE

I. GENERAL

- A. Scope: This Item governs for materials used; for storing, measuring, and handling of materials; and for proportioning and mixing of concrete. Use either ready-mixed concrete conforming to ASTM C94 or site mixed concrete. Contractor to assume responsibility for design of concrete mixtures. Furnish statement giving proportions of materials that will be used in each class of concrete that is to be incorporated into project. Furnish commercial laboratory reports showing that proportions and materials selected will produce laboratory mixed concrete of specified quality and having strengths twenty (20) percent greater than strengths specified herein.
- B. Related Work (if utilized in this project)
 - 1. Item 3200 - Concrete Reinforcement

II. MATERIALS

- A. Cement: In accordance with ASTM C150 or C175. Conform to applicable ASTM Specifications for weight variations and length of storage. Cement which has become caked or lumped not permitted. Deliver in bags for site- mixed concrete. No Fly Ash Allowed.
- B. Water: Clean and free of deleterious amounts of acid, alkali or organic matter. Water which is suitable for drinking or for ordinary household use may be accepted for use without being tested. Other water must be tested and determined to be in accordance with current "Standard Method of Test for Quality of Water to be Used in Concrete."
- C. Coarse Aggregate: Consist of gravel or crushed stone.
 - 1. Gravel: Consist of durable particles of gravel, crushed or uncrushed, having a wear of not more than forty (40) percent.
 - 2. Crushed Stone: Consist of durable particles of rock of reasonably uniform quality throughout and having a wear of not more than forty (40) percent.

3. Deleterious Substances: Maximum permissible percentages of deleterious substances not to exceed following percentages by weight.

Material removed by decantation, ASTM C117	1.0%
Shale, slate, or similar materials	1.0%
Clay lumps	.25%
Soft fragments	3.0%
Others, including friable, thin, elongated or laminated pieces	3.0%

Sum of all deleterious ingredients, exclusive of material removed by decantation, not to exceed five (5) percent by weight. Aggregate to be free from an excess of salt, alkali, vegetable matter, or other objectionable materials either free or as adherent coating.

4. Graduation: Conform to following grading requirements. Screens are construed to have circular openings.

Class A Concrete and Class E Concrete:

Retained on 1½" screen	0 to 5%
Retained on ¾" screen	25 to 60%
Retained on ¼" screen	95 to 100%

Class B Concrete:

Retained on 2½" screen	0 to 5%
Retained on 1¼" screen	25 to 60%
Retained on ¾" screen	40 to 75%
Retained on ¼" screen	95 to 100%

Class C Concrete:

Retained on 3" screen	0 to 5%
Retained on 1½" screen	25 to 60%
Retained on 1" screen	40 to 75%
Retained on ¼" screen	95 to 100%

Class D Concrete:

Retained on 1" screen	0 to 5%
Retained on ½" screen	25 to 75%
Retained on ¼" screen	95 to 100%

- D. Fine Aggregate: Consist of sand or a combination of sand and not more than fifty (50) percent of stone screenings.

1. Sand: Composed of cleaned, hard, durable, uncoated grains.

2. Stone Screenings: Consist of clean, hard durable, uncoated fragments resulting from crushing of stone.
3. Mineral Filler: Mineral filler may be combined with sand or sand and stone screenings specified above if such combination is necessary to meet grading requirement for fine aggregate. Filler consist of stone dust, clean crushed shell, crushed sand or other approved inert material. When subject to calorimetric test for organic impurities (ASTM C40), mixture of mineral filler and fine aggregate to be used in Portland Cement Concrete mixed in proportions proposed for use shall not show a color darker than standard color. Conform to following grading requirements (sieves are construed to have square opening).

Retained on 20 mesh sieve 0%
 Retained on 30 mesh sieve 0 to 5%
 Retained on 100 mesh sieve0 to 30%

E. Concrete Admixtures

1. Air-Entraining: Air-entraining agent required. Conform to ASTM C260. Use between three (3) and five (5) percent for Classes A, B, D, and E concrete. Determine air content by ASTM C138 or C173. No air-entraining agent required for seal slabs.
2. Others: Contractor may, at his option, use Possolith (Type VIII) or Plastiment admixture to reduce water and cement content of Classes A, B, D, and E concrete. If admixture is used, maximum reduction in cement content not to exceed “one- quarter” bag per cubic yard; compressive strength laboratory reports, as required hereinabove, to include admixture. No additional compensation allowed for concrete containing mixture.

F. Storage of Materials

1. Cement: Unless otherwise provided, store cement in well ventilated, weather proof buildings which protect cement from dampness. Support cement clear from floor or ground to prevent absorption of moisture. Engineer may permit storage of cement in open for short periods of time (maximum of forty-eight (48) hours) if raised storage platform and adequate waterproof covering are provided.
2. Aggregate: Handling and storage of concrete aggregate such as to prevent mixing with foreign materials. When contract requires use of two (2) or more sizes of aggregate, store in such manner as to prevent intermixing. Handle materials in stockpiles of all weeds and grass.

Bottom layer of aggregate not to be used without recleaning. Stockpile all fine aggregate for at least twenty-four (24) hours prior to use in order to reduce free moisture content.

- G. Measurement of Materials by Weight: Measure materials, except water, used in batches of concrete by weight, as outlined herein. Weigh fine aggregate, coarse aggregate, and mineral filler separately. Make allowances for water content when moist aggregates are used. Determine quantities of each component material of batch, as set forth, and make no change without approval. Base quantities of material per batch upon using full bags of cement. Batches involving use of fractional bags not permitted.
- H. Weighing and Measuring Equipment: Capacity of weighing equipment adequate to permit required weighing of materials without delaying production of mixer. Following general requirements apply to all types of weighing equipment contemplated:
 - 1. Weighing Container: Use weighing container of suitable size, shape, and tight enough to hold materials. Design and construct weighing container and its appurtenances such as to eliminate retentions of varying tare materials on any of its parts. Container capable of being fully and quickly discharged without shaking or jarring scales.
 - 2. Scales: Provide scales, that is, balance or weighing mechanism of beam or springless dial type. Use product of nationally known and established manufacturer for this type of equipment. Scales of simple rugged design with minimum number of adjustments consistent with accuracy required and suited for supporting weighing containers. Maintain a maximum tolerance of one (1) percent of net load being weighted. Design and construct parts of weighing mechanism, such as beam, levers, pivots, connections, etc., of such materials as will be consistent with conditions of use and accuracy required. Mount scales on a firm foundation and keep level. Unless scale is equipped with multiple weight beam which permits weighing of more than one kind of material on same scale without changing settings on weight beams, furnish separate scale units for each kind of material.
- I. Water: Provide device for measuring quantity of water which indicates in gallons and fractions thereof. Operating mechanism regulates quantity of water required for any given batch within one percent (1%). Cut-off supply inlet automatically when water is discharged into mixer.

- J. Classification and Proportions: Proportion as determined by laboratory design reports, using methods outlined in Texas State Highway Bulletin C-1 for design of mixes by absolute volumes and in accordance with requirements hereinafter set forth. Minimum cement content, maximum allowable water content and maximum slump for various classes of mixes follows:

Class Type	Minimum Cement Bags Per Cubic Yard	Maximum Water Gallons Per Bags (net)	Maximum Slump Inches
A. Structural	5.25	6.25	2½ to 4½
B. Fill	4.25	8.00	2½ to 4
C. Pipe Blocking	3.00	10.5	3 to 5
D. Seal Slab	4.00	-----	6 to 8
E. Paving	5.50	6.25	1 to 3

During progress of work, Contractor will maintain a careful check of the quantity of cement used in each structural unit. Make such adjustments, with approval, in mix design to correct for any variations of more than two (2) percent from theoretical cement content when such variations are attributable to mix design. In calculations for theoretical quantity of cement required, make allowances for embedded reinforcing steel, embedded structural steel and all paneling or chambers more than 3-inches in width.

- K. Consistency: In general, consistency of concrete mixtures as follows:
1. Mortar clings to coarse aggregate.
 2. Concrete is not sufficiently fluid to segregate when transported to place of deposit.
 3. Mortar shows no free water when removed from mixer.
 4. Concrete settles into place when deposited in forms. When transported in metal chutes at an angle of thirty (30) degrees with horizontal, concrete slides (not flows) into place.

Any mix failing to meet above outlined consistency requirements, although meeting slump requirements, is unsatisfactory. Change mix, upon approval, to correct such unsatisfactory conditions. In cases when characteristics of aggregate furnished are such that, with maximum allowable amount of water, specified slumps and consistency requirements are not met, Contractor may provide aggregate of an improved grading, or modify mix design to meet the slump and consistency requirements by adding either mineral filler or cement, or both as may be necessary. In

case mineral filler is used, combined total quantity of mineral filler and fine aggregate passing 100 mesh sieve may not exceed twenty (20) percent of weight of fine aggregate. Perform slump test in accordance with methods outlined in ASTM C143.

L. Quality of Concrete

1. General: Concrete made of acceptable materials, of proportions specified, meeting strength requirements, and in complete accordance with requirements of construction methods and details specified will be considered as of satisfactory quality.
2. Test Cylinders: Engineer will cast test cylinders or beams of the number and type desired for testing to maintain a check on compressive and flexural strength of concrete actually being placed. Contractor provides curing facilities for purpose of curing concrete test specimens. Include cost of all materials used in test specimens. Include cost of all materials used in test specimens and cost of providing and maintaining curing facilities in Contract prices bid.

M. Mixing Conditions: Mix concrete in quantities required for immediate use. Do not use any concrete which is not placed within thirty (30) minutes after being discharged from mixer. Retempering of concrete not permitted. In threatening weather, which may result in conditions that will adversely affect quality of concrete to be placed, Engineer may order postponement of concrete placement. Where work has been started and changes in weather conditions required protective measures to be used, furnish adequate shelter to protect concrete against damage from rainfall or damage due to freezing temperatures. In case it is necessary to continue mixing operations during rainfall, provide protective coverings for material stock piles only to extent necessary to control moisture conditions in aggregates so as to maintain adequate control of consistency of concrete mix. Do not mix concrete, without approval when air temperature is at or below 40° F (taken in shade away from artificial heat) and falling. If authorized, concrete may be mixed when air temperature is at 35° F and rising. When permission is given for mixing at temperatures below 40° F, conform to following requirements:

Heat water used for mixing to a temperature of at least 70° F but not over 150° F. Heat aggregate by either steam or by dry heat to temperatures of at least 70° F but not over 150° F. Heating apparatus such as to heat mass of aggregates uniformly and preclude occurrence of hot spots which burn materials. Temperature of mixed concrete not to be less than 60° F at time of placing in forms.

III. EXECUTION

A. Mixing and Mixing Equipment

1. Mix in batch mixer of approved type and size which insures uniform distribution of material throughout mass so that mixture is uniform in color and smooth in appearance. Use mixer of minimum rated size of five (5) cubic foot batch capacity for continuous placement of concrete involving fifteen cubic yards or less. For larger concrete placements, use mixer of at least fourteen cubic feet batch capacity. Use of two or more small mixers, operating simultaneously and continuously may be used in lieu of larger mixer. Size of mixer(s) governed by volume of concrete to be placed in one continuous pour.
2. Mix, after all ingredients are assembled in drum, for minimum time of one and one-half minutes for fourteen cubic foot mixers and smaller, and for minimum time of one minute for twenty-one cubic foot mixers and larger. Drum speed during mixing between fourteen and twenty revolutions per minute. Equip mixer with speed regulator to hold mixer to its normal speed of revolutions.
3. Discharge entire contents of drum before any materials for succeeding batch are placed therein. For first batch of concrete materials placed in mixer provide sufficient extra quantities of cement, sand, and water to coat inside surface of drum without diminishing mortar content of mix. Upon cessation of mixing for any considerable length of time, thoroughly clean and wash mixer out.
4. Equip concrete mixer with automatic timing device which is actuated when skip is raised to its full height and dumped. Arrange device to lock discharge mechanism to prevent emptying of mixer until all materials have been mixed together for minimum time required. Device to ring bell after specified time of mixing.
5. Arrange water tank so that amount of water can be accurately measured. Automatically shut-off inlet supply while tank is discharging.
6. Remove any concrete mixer from site of work which is not adequate or suitable for work or not in satisfactory state of repair. Provide suitable replacement mixer. Improperly mixed concrete not permitted.

- B. Transit or Ready Mix Concrete: Proportion and prepare in accordance with requirements set forth hereinbefore. If central-mixed completely mix at central plant and then transport in agitator trucks; mixing time as specified hereinbefore. If transit-mix concrete is used, use truck mixer which is water-tight when closed.

Mix each batch of transit-mix concrete for one hundred (100) revolutions at mixing speed as specified by mixer manufacturer. Perform any additional mixing or agitation at rate specified for agitation.

1. Equip truck mixers with water tanks and measuring devices which permit positive measurement of mixing water.
 2. Concrete delivered by truck mixers to be of consistency specified hereinbefore. Place transit or ready-mix concrete within one and one-half (1½) hours after introduction of cement into mixer. Placement of concrete over one and one-half (1½) hours of age not permitted.
- C. Hand-Mixed Concrete: Hand mixing permitted only for small placements or in case of an emergency and then only on authorization. Perform mixing in water tight mixing box. Mix fine aggregate and cement thoroughly until mixture is uniform in color, then spread over bottom of mixing box in thin layer. Saturate coarse aggregate with water spread over whole mass of additional water is added. After all ingredients have been added, turn entire mass at least six times or more if necessary, so that mixture is uniform in color and smooth in appearance. Hand mixed batches not to exceed two (2) bag batch in volume.