

PROJECT MANUAL

**BID REQUIREMENTS, CONTRACT REQUIREMENTS, &
TECHNICAL SPECIFICATIONS**

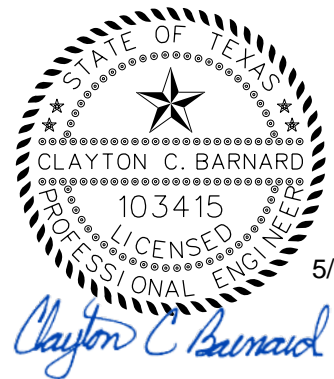
Lebanon Road Improvements and Force Main

Munis No. 15608

BID No. 1704-071



PROGRESS IN MOTION.



5/1/2017

CITY OF FRISCO
Freese & Nichols, Inc.
5805 Main Street, Suite B
Frisco, TX 75034
Firm Registration No. F-2144

FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

Issue for Bid
May 2017

LEBANON ROAD IMPROVEMENTS AND FORCE MAIN

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LEBANON ROAD IMPROVEMENTS AND FORCE MAIN
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Responsible Engineer



5/1/2017

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**CITY OF FRISCO
LEBANON ROAD IMPROVEMENTS AND FORCE MAIN
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Responsible Engineer



05-01-2017

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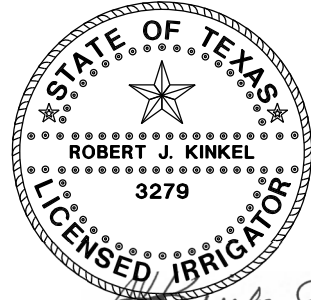
**CITY OF FRISCO
LEBANON ROAD IMPROVEMENTS AND FORCE MAIN
SPECIFICATION SEALS**

DIVISION 32 EXTERIOR IMPROVEMENTS

32 84 23

Landscape Irrigation

Responsible Irrigator



A handwritten signature in black ink, appearing to read "Robert J. Kinkel", written over a horizontal line.

05/01/2017

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LEBANON ROAD IMPROVEMENTS AND FORCE MAIN
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Responsible Architect



Matthew Milano

05/01/2017

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Responsible Engineer



Robin E. Ernstrom

FREESE AND NICHOLS, INC.
TEXAS REGISTERED
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SECTION 1
BID REQUIREMENTS

ADVERTISEMENT TO BIDDERS
BID NO. 1704-071

Sealed Bids addressed to City of Frisco Engineering Services, 6101 Frisco Square Boulevard, 3rd Floor, Frisco, TX 75034, will be received at the office of Engineering Services of the City of Frisco until **10:00 AM on 5/30/2017**. The envelope must be sealed and clearly marked "SEALED BID Number **1704-071** for LEBANON ROAD IMPROVEMENTS AND FORCE MAIN". Bids will be publicly opened and read at City Hall on **5/30/2017 at 10:00AM**. for the following project:

LEBANON ROAD IMPROVEMENTS AND FORCE MAIN

An optional pre-bid meeting will be held at City Hall Conference Room **3A** on **5/24/2017 at 10:00AM**

Bidders must submit with their bids a Cashier's Check in the amount of five percent (5%) of the maximum amount bid, payable without recourse to the OWNER or a Bid Bond in the same amount from an approved Surety Company as guarantee that the Bidder will enter into a contract and execute bond and guarantee forms provided within ten (10) days after notice of award of contract is issued to him or her.

The successful Bidder must furnish performance and payment bonds each in the amount of 100 percent (100%) of the Contract price from an approved Surety Company holding a permit from the State of Texas, to act as Surety.

All unit prices must be stated in both words and numerals. Electronic bids will not be accepted unless accompanied by a hard copy with the appropriate signatures. The OWNER reserves the right to reject any or all bids and to waive any irregularities or formalities. In case of ambiguity or lack of clearness in stating the price of the bids, the OWNER reserves the right to consider the most advantageous construction thereof, or to reject the bid. Unreasonable or unbalanced unit prices will be considered sufficient cause of rejection of any bid or bids.

Bidders are expected to inspect the site of the Project and to inform themselves regarding local conditions and conditions under which the Project is to be done. Attention is called to the provisions of the Acts of the 43rd Legislature of the State of Texas and subsequent amendments concerning the wage scale and payment of prevailing wages. The prevailing wage rates established annually by City Council Resolution are applicable to this project and made part of the Contract Documents. Not less than these rates must be paid on this Project.

Advertisement and bid phase information for the Project can be found at the following web site:

<http://construction.freese.com>

Contract Documents may be downloaded or viewed free of charge at this web site. It is the downloader's responsibility to determine that a complete set of documents, as defined in the Instructions to Bidders are received. Printed copies of the Contract Documents may be purchased at the website for the cost of printing. The cost for printed Contract Documents is not refunded.

This web site will be updated periodically with addenda, planholders lists, bid tabulations, additional reports or other information relevant to bidding the Project.

Receipt of responses does not bind the OWNER to any contract of said products or services, nor does it give any guarantee that a contract for the bid will be awarded.

INSTRUCTIONS TO BIDDERS
BID NO. 1704-071

1. PROJECT DESCRIPTION

The Lebanon Road Improvements and Force Main project generally includes the construction of approximately 4,065 LF of 18-inch force main and approximately 10,280 LF of 20-inch force main with 2,680 LF installed by horizontal directional drill. The remaining installation will be by open cut installation with approximately 2,060 LF of jack/bore/tunneling. This project also includes the widening of Lebanon Road between Village Blvd. and Starwood Drive. Pavement markings and traffic signal improvements are included with the widening portion of this project.

2. PRE-BID MEETING

An optional pre-bid meeting will be held at **10:00AM on 5/24/2017**. Representatives of OWNER and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the meeting. OWNER will transmit to all prospective Bidders of record such Addenda as OWNER considers necessary in response to questions arising at the meeting. Oral statements may not be relied upon and will not be binding or legally effective.

3. BID FORM

The OWNER shall furnish Bidders with a Bid Form which shall state the general location and description of the contemplated Project and which shall contain an itemized list of the items of Work to be done or materials to be furnished, and upon which bid prices are asked. The Bid Form shall specify the form and amount of the bid guaranty.

4. QUANTITIES IN BID FORM

The quantities of the Work and materials set forth in the Bid Form or on the plans approximately represent the Work to be performed and materials to be furnished, and are for the purpose of comparing the bids on a uniform basis. Payment shall be made to the CONTRACTOR only for the actual quantities of Work performed or materials furnished as measured in the field or otherwise determined by the OWNER in accordance with the Contract Documents; and it is understood that the quantities may be increased or decreased as hereinafter provided, without in any way invalidating the bid prices.

5. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF THE PROJECT

Bidders are advised that the plans, specifications and other documents on file as stated in the advertisement shall constitute all the information, which the OWNER shall furnish. Bidders are required, prior to submitting any bid, to review the plans and read the Bid Requirements, Contract Requirements, and Technical Specifications carefully; to obtain and read the most current versions of all referenced City, local, State, Federal, and National Laws, Regulations and standards; to visit the site of the Work; to examine carefully local conditions; to inform themselves by their independent research, tests and investigations of the difficulties to be encountered and judge for themselves the accessibility of the Work and all attending circumstances affecting the cost of doing the Work or time required for its completion; and to obtain all information required to make a responsive bid.

No information given by the OWNER or any official thereof, other than that shown on the plans and contained in the technical specifications, bid form, and other Contract Documents, shall be binding upon

which are necessary for full and complete information upon which the bid may be based. Any Bidder, by submitting a bid, represents and warrants: that it has prepared the bid in accordance with the technical specifications, with full knowledge and understanding of the terms and provisions thereof; that it has done any inspection or test it deems appropriate; that it has reviewed, studied and examined its bid prior to the signing and submission of same; and that it was cognizant of the terms of its bid, verified its calculations and found them to be correct and agrees to be bound thereby.

6. PREPARATION OF BID FORM

The Bidder shall submit its bid on the forms furnished or approved by the OWNER. All blank spaces in the form shall be correctly filled in and the Bidder shall state the prices, both in words and numerals, for which it proposes to do the Work, contemplated or furnish the material required. Such prices shall be written in ink distinctly and legibly. In cases of discrepancy between the price written in words and price written in numerals, the OWNER shall select the one most favorable to the OWNER; provided that it does not create a material mistake in the bid or otherwise change the result of bidding. If an individual submits the bid, that individual or duly authorized agent must sign the bid. If an association or partnership submits the bid, the name and address must be given and the bid signed by a duly authorized member of the association or partnership. If a corporation submits the bid, the corporate name and business address must be given and the bid signed by a duly authorized corporate officer or agent. Powers of attorney authorizing agents to sign the bid must be properly certified and must be in writing and submitted with the bid. The bid shall be executed in ink.

Electronic Bid Forms. Computer-generated pages of the bid form may be used in lieu of the Bid Form provided. This option is provided for the convenience of the Bidder.

The use of an electronic Bid Form shall not contain added wording intended to modify or amend the wording in the OWNER's Bid Form, or the provisions of the Contract Documents, including the plans, specifications, or Special Conditions. All bid items, bid amounts (unit prices and extended totals), subtotals, and total bid must be submitted, and the risk of error, omission, or failure to include each in accordance with the OWNER's final published Bid Form shall be borne solely by the Bidder; and in the event the electronic bid form is not provided in accordance with the OWNER's final published Bid Form, the bid shall be declared non-responsive.

The Bidder shall provide the following disclaimer on the electronic bid form; otherwise, the bid will be considered non-responsive and rejected:

_____ (Company name) certifies that the Bid Item Number, Specification Item, Name of Pay Item, Estimated Quantity, Unit, Unit Price Bid, and Amount Bid shown on this electronic bid form for all of the bid items contained in this Bid Form are consistent with the Bid Form provided herein, and that its bid will be tabulated using these Unit Prices and no other information from this electronic bid form.

The Company further acknowledges and agrees the Total Bid Amount shown will be read as its Total Bid and further agrees that the official Total Bid Amount will be determined by multiplying the Unit Prices shown in the electronic bid form by the respective estimated quantities shown in the Bid Form and then totaling all of the extended amounts.

Electronic bids will not be accepted unless accompanied by a hard copy with required signatures and as long as all legal and bid requirements are met.

The OWNER reserves the right to reject any or all bids and to waive any irregularities or formalities. The CONTRACTOR accepts all risks associated with bidding in this manner. It is understood and agreed that the bid may not be withdrawn once the bid-opening process has begun.

Qualifications of Bidders: To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its bid written evidence such as financial data, previous experience, present commitments, and such other data as called for in AGC's "Construction Contractor's Qualification Statement for Engineered Construction," AGC Document No. 220. AGC Document No. 220 may be utilized.

Safety Record. If the safety record is part of the bid requirements in accordance with Section 252.0435, Local Government Code, each CONTRACTOR bidding on projects must submit a notarized affidavit with its bid attesting to its safety record. This information may be considered in determining the responsibility of the Bidder for purposes of award.

7. BID GUARANTY

No bid shall be considered unless it is accompanied by a cashier's check on any state or national bank or acceptable bidder's surety bond, as specified in the General Conditions, "*GC 2 - Award and Execution of Contract*", payable unconditionally to the OWNER. The cashier's check or bidder's surety bond shall be in the amount of not less than five (5) percent of the award. The bid guaranty is required by the OWNER as evidence of good faith and as a guarantee that if awarded the Contract, the Bidder shall execute the Contract and furnish the required bonds and evidence of insurance within ten (10) days after receipt of the awarded Contract or pay the damages as set forth below. The Bidder's surety bond shall be conditioned that, if the bid is withdrawn after the bids have been opened or the CONTRACTOR refuses to execute the Contract in accordance with its bid and provide the required surety bonds, the CONTRACTOR and the surety shall become liable to the OWNER for the amount of the Bidder's surety bond.

In the event a cashier's check is submitted along with the bid, and the CONTRACTOR does not execute the Contract and provide the required surety bonds and evidence of insurance within ten (10) days after receipt of the awarded Contract, or withdraws its bid after bids have been opened, the OWNER shall be entitled to the proceeds of such check.

8. FILING OF BIDS

No bid shall be considered unless it is filed at the place and within the time limit for receiving bids as stated in the advertisement or any addendum. Each bid shall be in a sealed envelope, plainly marked with the words "SEALED BID-" and the name or description of the project as designated in the advertisement.

9. WITHDRAWING BIDS

Bids filed with the OWNER can be withdrawn or modified and redeposited prior to the time set for opening bids. Request for non-consideration of bids must be made in writing and addressed to the OWNER prior to the time set for opening bids. After other bids are opened and publicly read, the bid for which non-consideration is properly requested will be returned unopened. The bid may not be withdrawn after the bid opening has commenced. The Bidder, in submitting the same, warrants and represents that its bid has been carefully reviewed and checked and that it is in all things true and accurate and free of mistakes and that such bid shall not and cannot be withdrawn after opening because of any mistake committed by the Bidder; provided, however, that any Bidder may withdraw its bid 90 days after the actual date of opening thereof, should no award have been made to such Bidder.

10. OPENING BIDS

The bids filed with the OWNER shall be opened at the time stated in the advertisement and/or in the Notice to Bidders or any subsequently issued addendum, and publicly read aloud, and shall thereafter remain on file with the OWNER. No Contract shall be awarded based on such bids until after at least two days have elapsed.

11. CONSIDERATION OF BID

After bids are opened, the bids shall be tabulated for comparison on the basis of the bid prices and quantities shown in the bid form. Until final award of the Contract, the OWNER reserves the right to reject any or all bids, to waive technicalities or irregularities at its option, to readvertise for new bids or proceed to do the Work otherwise in the best interests of the OWNER. Each Bidder shall be furnished upon request a copy of the bid tabulation within 60 days of award of Contract by City Council.

12. IRREGULAR BIDS

Bids shall be considered irregular if they show any omissions, alterations of form, additions, unbalanced values or conditions not called for, unauthorized alternate bids or other irregularities of any kind. The OWNER may reject any bid containing any such irregularity. The OWNER, however, reserves the right to waive any irregularities and to make the award in the best interest of the OWNER.

13. REJECTION OF BIDS

The OWNER reserves the right to reject any or all bids; and all bids submitted are subject to this reservation. Bids may be rejected for any of the following specific reasons:

- (1) bids received after the time limit for receiving bids as stated in the advertisement or any subsequently issued addendum;
- (2) bids unaccompanied by the required bid security;
- (3) bids constituting a nonresponsive bid;
- (4) bids containing unsolicited conditions or qualifications;
- (5) failure to use the OWNER'S form of bid bond in submitting bid; or
- (6) a bid submitted with a bid bond issued by a surplus line company or by a surety not licensed to transact insurance business in the State of Texas.

14. DISQUALIFICATION OF BIDDERS

Bidders may be disqualified and their bids not considered for any of the following specific reasons:

- (1) reasonable belief that collusion exists among the Bidders;
- (2) reasonable belief that any Bidder has a financial interest in more than one bid for the Work contemplated;
- (3) the Bidder having a history of filing frequent, excessive and meritless claims, or fraudulent claims, against the OWNER, or against other contractors on a project of the OWNER;
- (4) the Bidder or its surety having defaulted on a previous Contract, or the Bidder performing poorly on a previous Contract;
- (5) lack of competency, skill, judgment, financial capability, integrity, reputation, reliability or responsibility to perform the Work as revealed by the bid form, bid questionnaires, financial

- statement, performance history or other relevant information obtained by the OWNER.
- (6) uncompleted Work which in the judgment of the OWNER shall prevent or hinder the prompt completion of additional Work if awarded;
 - (7) failure of Bidder to use OWNER'S form of bid bond in submitting its bid, or submission of a cashier's check drawn on a state or national bank not located in the OWNER'S jurisdictional area; or
 - (8) unbalanced value of any bid items.

15. RETURN OF BID GUARANTY

Upon request, the OWNER shall normally return the bid guaranties accompanying all bids within ten (10) working days after bid opening except for the three apparent low Bidders. The three apparent low bid guaranties shall be retained by the OWNER until the required Contract and Surety Bonds have been executed, after which they shall be returned upon request.

16. ADDENDA

Bidders wanting further information, interpretation or clarification of the Contract Documents must make their requests in writing to the OWNER, specifically the City Engineer or its designee, at least 96 hours prior to bid opening. Interpretations or clarifications considered necessary in response to such questions will be issued by Addenda and mailed or emailed to all parties recorded by OWNER as having received the Bidding Documents. Only questions answered by Addenda will be binding.

Bidder shall promptly give OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by OWNER is acceptable to Bidder.

Any addenda issued will be mailed or emailed to each prospective Bidder based upon contact information furnished by the prospective Bidder. The bid form as submitted by the Bidder must be so constructed as to include any addenda issued by the OWNER prior to 48 hours of the opening of bids, with the appropriate recognition of addenda so noted on the bid form. No addenda will be issued within 48 hours of the bid opening.

17. MAINTENANCE BOND

The CONTRACTOR will be required to provide a Maintenance Bond executed by a corporate surety in accordance with Article 7.19-1, Vernon's Texas Insurance Code, in the amount of **100 percent** of the Contract guaranteeing the prompt, full, and faithful performance of the general guaranty and warranty contained in the Contract Documents.

BID BOND

STATE OF TEXAS §
 §
COUNTY OF COLLIN §

KNOW ALL MEN BY THESE PRESENTS:

THAT _____ {contractor} _____, a corporation organized and existing under the laws of the State of _____, and fully authorized to transact business in the State of Texas, whose address is _____ of the City of _____, County of _____, State of _____ (hereinafter referred to as "Principal"), and _____ (hereinafter referred to as "Surety"), a corporation organized under the laws of the State of _____ and authorized under the laws of the State of Texas to act as Surety on bonds for principals, are held and firmly bound unto the City of Frisco, Texas (hereinafter referred to as "OWNER") in the penal sum of \$ _____ in lawful money of the United States, for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors, and assigned, jointly and severally, firmly by these presents:

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

WHEREAS, the Principal is herewith submitting its proposal for Lebanon Road Improvements and Force Main the condition of the above obligations are such that if the aforesaid Principal shall be awarded the Contract, the said Principal will, within the time required, enter into a Contract and give Bonds, if required, for the faithful performance of the Contract and the prompt payment for labor and materials in the prosecution thereof, then this obligation shall be null and void; otherwise the Principal and Surety will pay unto the OWNER the full penal sum hereof, as liquated damages, it being difficult and impractical to determine accurately the amount of damages occurring to OWNER by reason of Principal's failure to execute said Contract and Bonds.

PROVIDED FURTHER, that if any legal action be filed upon this Bond, venue shall lie exclusively in Collin County, Texas.

The Resident Agent of the Surety for delivery of notice and service of process is:

Name: _____
Address: _____
Phone Number: _____

WITNESS

PRINCIPAL

Printed/Typed Name _____
Title: _____
Company: _____
Address: _____

WITNESS

SURETY

Printed/Typed Name _____
Title: _____
Company: _____
Address: _____

NOTE: CERTIFIED COPY OF POWER-OF-ATTORNEY SHOULD BE ATTACHED HERETO.

BID FORM
FOR
LEBANON ROAD IMPROVEMENTS AND FORCE MAIN
CITY OF FRISCO, TEXAS

(THIS BID FORM MUST NOT BE REMOVED FROM THE BIDDING DOCUMENTS. REVISED BID FORMS ISSUED BY ADDENDA SHALL BE ATTACHED OR BOUND TO THE BIDDING DOCUMENTS.)

Date _____

TO: **Engineering Services**
City of Frisco
3rd Floor East
6101 Frisco Square Boulevard
Frisco, TX 75034

FROM: _____

(Name and Address of Bidder)

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Standard Construction Contract with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
2. Bidder accepts all of the terms and conditions of the Advertisement to Bidders and Instructions to Bidders, including without limitation those dealing with the disposition of Bid guaranty. This Bid will remain subject to acceptance for sixty (60) days after the day of Bid opening. Bidder will sign and deliver the required number of counterparts of the Contract with the Bonds and other documents required by the Bidding Requirements within ten (10) days after the date of OWNER's Notice of Award.
3. Base Bid Project Contract Time/Completion - Bidder agrees to Substantial Completion of the Work in full within three hundred (300) calendar days and Final Completion of all Work within three hundred and forty-five (345) calendar days.

4. In submitting this Bid, Bidder represents, as more fully set forth in the Contract, that:

- (a) Bidder has examined and carefully studied the Bidding documents and the following Addenda receipt of all which is hereby acknowledged: (List Addenda by Addendum Number and Date)

Addendum No. 1 – Date Received: _____

Addendum No. 2 – Date Received: _____

Addendum No. 3 – Date Received: _____

- (b) Bidder has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance and furnishing of the Work related to the Project.
- (c) Bidder is familiar with and is satisfied as to all City, local, State, Federal and National Laws, Regulations and standards that may affect cost, progress, performance and furnishing of the Work related to the Project.
- (d) Bidder has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface of subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Contract Documents. Bidder accepts the determination set forth in the Contract Documents. Bidder acknowledges that such reports and drawings are not Contract Documents and may not be complete for Bidder's purposes. Bidder acknowledges that OWNER and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work related to the Project or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work related to the Project in accordance with the times, price and other terms and conditions of the Contract Documents.
- (e) Bidder is aware of the general nature of Work to be performed by OWNER and others at the Project site.
- (f) Bidder has correlated the information known to Bidder, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations investigations, explorations, tests, studies and data with the Contract Documents.
- (g) Bidder has thoroughly reviewed the project and has submitted to the OWNER, at least 96 hours in advance of the date for opening bids, all questions regarding the meaning or intent of the Contract Documents and particularly all questions regarding issues which may affect the pricing or measurement and payment of the project.
- (h) Bidder has capacity to furnish to the OWNER payment, performance, and maintenance bonds in accordance with the requirements of the Contract Documents.

Item No.	Spec. Item	Name of Pay Item with Unit Price in Words	Est. Quantity	Unit	Unit Bid Price	Amount Bid
A GENERAL ITEMS						
1		General Site Preparation	1	LS		
	02 41 00	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
2		Storm Water Pollution Prevention Plan	10	MO		
	31 25 00	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
3		Project Sign	4	EA		
	01 58 13	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
4		Trench Safety		LF		
	33 05 10	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit **Quantity for Trench Safety cannot be less than 9,222 LF**				
5		Barricades, Signs, and Traffic Handling	10	MO		
	34 71 13	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				

TOTAL BID AMOUNT FOR ITEM A

(Total Amount Bid, Numerical Value)

B FORCE MAIN						
1		RFID Markers	122	EA		
	01 70 01	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
2		Jack, Bore, or Tunnel (Steel Casing)(36")	2,148	LF		
	33 05 23.33	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
3		Force Main - Fusible PVC (DR 18)(20") (Horizontal Directional Drill)	2,680	LF		
	33 05 23.13	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
4		Combination Air Valve (2")	9	EA		
	33 12 16	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
5		Reuse Water Line Combination Air Valve (2")	1	EA		
	33 12 16	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
6		Plug Valve (12")	1	EA		
	33 12 16.19	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				
7		Plug Valve (18")	2	EA		
	33 12 16.19	Complete in Place, for the Sum of _____ Dollars and _____ No Cents per unit				

8		Plug Valve (20")	8	EA		
	33 12 16.19	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
9		Force Main - PVC (DR 18)(12")	20	LF		
	33 11 14	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
10		Force Main - PVC (DR 18)(18")	4,067	LF		
	33 11 14	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
11		Force Main - PVC (DR 18)(20")	7,534	LF		
	33 11 14	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				

TOTAL BID AMOUNT FOR ITEM B

(Total Amount Bid, Numerical Value)

C ROADWAY						
1		Remove Concrete Pavement	2,251	SY		
	02 41 00	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
2		Excavation (Roadway)	14,595	CY		
	31 23 16	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
3		Flexible Base (Complete in Place)(TY-D GR-1-2)(12")	21,892	SY		
	32 11 16	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
4		Reinforced Concrete Pavement (9")	12,887	SY		
	32 13 13	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
5		Concrete Median Nose (Type 2)	13	EA		
	32 16 60	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
6		Pavement Markers & Markings (Type I & II)(Y)(4")	27,124	LF		
	32 17 23	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
7		Pavement Markers & Markings (Type I & II)(W)(8")	1,550	LF		
	32 17 23	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
8		Pavement Markers & Markings (Type I & II)(Y)(12")	470	LF		
	32 17 23	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				
9		Pavement Markers & Markings (Type I & II)(W)(24")	135	LF		
	32 17 23	Complete in Place, for the Sum of				
		Dollars and				
		No Cents per unit				

10		Pavement Markers & Markings (Type I & II)(W)(Arrow)	21	EA		
	32 17 23	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
11		Pavement Markers & Markings (Type I & II)(W)(Word)	12	EA		
	32 17 23	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
12		Raised Pavement Marker (Type II-A-A)	678	EA		
	32 17 25	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
13		Pavement Marking Removal	1,300	LF		
	32 17 23	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
14		Traffic Signal Modifications	3	EA		
	34 41 13	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
15		Vehicle Signal Heads (Install)	21	EA		
	34 41 25	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
16		Traffic Signal Cable (Furnish and Install)	432	LF		
	34 41 30	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
17		Single Post Small Sign Assembly (Furnish and Install)	14	EA		
	34 41 50	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
18		Double Post Small Sign Assembly (F&I, sign panel by others)	5	EA		
	34 41 50	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
19		Replace Roadway Light Fixtures (Supplied by Others)	76	EA		
	26 56 20	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				
20		Relocate Luminaire Pole	10	EA		
	26 56 19	Complete in Place, for the Sum of				
		_____ Dollars and				
		_____ No Cents per unit				

TOTAL BID AMOUNT FOR ITEM C _____

(Total Amount Bid, Numerical Value)

D		LANDSCAPE ARCHITECTURE			
1		Hydraulic Mulch Seeding	7,963	SY	
	32 92 23	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			
2		Sod	16,648	SY	
	32 92 23	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			
3		Remove Existing Tree	83	EA	
	02 41 00	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			
4		Street Trees	143	EA	
	32 93 00	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			
5		Booster Shrubs	24	EA	
	32 93 00	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			
6		Landscape Irrigation	1	LS	
	32 84 23	Complete in Place, for the Sum of			
		_____ Dollars and			
		_____ No Cents per unit			

TOTAL BID AMOUNT FOR ITEM D

 (Total Amount Bid, Numerical Value)

TOTAL BID AMOUNT (A + B + C + D)

 (Total Amount Bid, Numerical Value)

 (Total Amount Bid in Words)

5. Unit prices have been computed in accordance with the General Conditions. With the exception of Plan Quantity Items specifically identified as such, Bidder acknowledges that, for unit price contracts, quantities are not guaranteed and final payment will be based on actual quantities determined, as provided in the Contract Documents.
6. Bidder agrees that the Work related to the Project will be completed and ready for final payment in accordance with the General Conditions on or before the dates or within the number of calendar days indicated in the Contract. Bidder accepts the provisions of the Contract as to liquidated damages in the event of failure to complete the Work related to the Project within the time specified in the Contract.
7. The following documents are attached to and made a condition of this Bid:
 - (a) Required Bid Security in the form of a certified or cashier's check or a Bid Bond in an amount of not less than 5 percent of the Bidder's award bid price, made payable to the OWNER, in accordance with the Instructions to Bidders.
 - (b) Certificate of Authority from the State of Texas if Bidder is an Out-of-State Corporation.
8. Communications concerning this Bid shall be addressed to the address of Bidder indicated below.
9. Terms used in this Bid which are defined in the General Conditions or Instructions will have the meanings indicated in the General Conditions or Instructions.

SUBMITTED on _____, 20____.

Respectfully Submitted,

Signed: _____

Company: _____

Address: _____

SEAL
(If Bidder is a Corporation)

Telephone: _____

Fax: _____

Submitted by: _____

Doing Business As: _____

- an individual
- a partnership
- a corporation
- a joint venture
- an LLC

SECTION 2
CONTRACT REQUIREMENTS

Article V. Debts

The OWNER may, at is option, offset any amounts due and payable under this Contract against any debt (including taxes) lawfully due to OWNER from CONTRACTOR, regardless of whether the amount due arises pursuant to the terms of this Contract or otherwise and regardless of whether or not the debt due to OWNER has been reduced to judgment by a court.

Article VI. Miscellaneous Provisions

The Contract Documents, which constitute the entire agreement between the OWNER and CONTRACTOR, are listed in Article II. No assignment by either party hereto of any rights under or interests in the Contract Documents will be binding on the other party hereto without the written consent of the party sought to be bound. The OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives hereto to the covenants, agreements, and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, the OWNER and CONTRACTOR have executed this Contract in duplicate and on the date aforementioned. All portions of the Contract Documents have been signed or identified by the OWNER and CONTRACTOR.

OWNER:
CITY OF FRISCO

CONTRACTOR:

By: _____

By: _____

Printed/Typed Name

Printed/Typed Name

Title

Title

Attest

Attest

(CORPORATE SEAL)

(CORPORATE SEAL)

Address for giving notices:

Address for giving notices:

City Manager's Office
5th Floor
6101 Frisco Square Blvd.
Frisco, TX 75034

Engineering Services Department
3rd Floor
6101 Frisco Square Blvd.
Frisco, TX 75034

PERFORMANCE BOND

STATE OF TEXAS §
§
COUNTY OF COLLIN §

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, a partnership organized and existing under the laws of the State of _____, and fully authorized to transact business in the State of Texas, whose address is _____ of the City of _____, County of _____, State of _____, (hereinafter referred to as "PRINCIPAL"), and _____ (hereinafter referred to as "SURETY"), a corporation organized under the laws of the State of _____ and authorized under the laws of the State of Texas to act as SURETY on bonds for principals, are held and firmly bound unto **City of Frisco, Texas** (hereinafter referred to as "OWNER") in the penal sum of \$ _____ (not less than 100% of the approximate total amount of the Contract as evidenced in the proposal of the stated penal sum as an additional sum of money representing additional court expenses, attorneys' fees, and liquidated damages arising out of or connected with the below identified Contract) in lawful money of the United States, for the payment whereof, the said PRINCIPAL and SURETY bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents:

WHEREAS, the PRINCIPAL has entered into a certain Contract with the OWNER, dated the _____ day of _____ 20__, to which said Contract is hereby referred to and made a part hereof and as fully and to the same extent as if copied at length herein for the construction of:

Lebanon Road Improvements and Force Main

NOW, THEREFORE, the condition of this obligation is such, that if the said PRINCIPAL fully and faithfully executes the Work and performance of the Contract in accordance with the plans, specifications, and Contract Documents, including any extensions thereof which may be granted with or without notice to SURETY, during the original term thereof, and during the life of any guaranty required under the Contract, and according to the true intent and meaning of said Contract and the plans and specifications hereto annexed, if the PRINCIPAL shall repair and/or replace all defects due to faulty materials or workmanship that appear within a period of one year from the date of final completion and final acceptance of the Work by OWNER; and if the PRINCIPAL shall fully indemnify and save harmless the OWNER from all costs and damages which OWNER may suffer by reason of failure to so perform herein and shall fully reimburse and repay OWNER all outlay and expense which the OWNER may incur in making good any default or deficiency, then this obligation shall be void; otherwise, to remain in full force and effect; and in case said CONTRACTOR shall fail to do so, it is agreed that the OWNER may do said Work and supply such materials and charge the same against said CONTRACTOR and SURETY on this obligation. Provided further, that if any legal action be filed on this Bond, venue shall lie in Collin County, Texas.

PROVIDED HOWEVER, that this Bond is executed pursuant to the provisions of Texas Government Code, Chapter 2253, as amended, and Article 7.19-1 of the Insurance Code, as amended, and all liabilities on this bond shall be determined in accordance with the provisions of said articles to the same extent as if they were fully copied at length herein.

SURETY, for value received, stipulates and agrees that the bond shall automatically be increased by the amount of any change order or supplemental agreement which increases the Contract price with or without notice to the SURETY, but in no event shall a Change Order or Supplemental Agreement which reduces the Contract price decrease the penal sum of this Bond. And further that no change, extension of time, alteration, or addition to the terms of the Contract, or to the Work performed thereunder, or the plans, specifications, or drawings accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the Work to be performed thereunder.

SURETY agrees that the bond provides for the repairs and/or replacement of all defects due to the faulty materials and workmanship that appear within a period of one (1) year from the date of final acceptance of the improvements by the OWNER.

The undersigned and designated agent is hereby designated by SURETY herein as the agent resident to whom any requisite notice may be delivered and on whom service of process may be had in matters arising out of such suretyship.

IN WITNESS WHEREOF, the said PRINCIPAL and SURETY have signed and sealed this instrument on this the _____ day of _____, 20__.

WITNESS

PRINCIPAL

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

WITNESS

SURETY

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

The Resident Agent of the SURETY for delivery of notice and service of process is:

Name: _____

Address: _____

Phone Number: _____

Note: Date of Bond must NOT be prior to date of Contract.

PAYMENT BOND

STATE OF TEXAS §
 §
COUNTY OF COLLIN §

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, a corporation organized and existing under the laws of the State of _____, and fully authorized to transact business in the State of Texas, whose address is _____ of the City of _____, County of _____, State of _____, (hereinafter referred to as “PRINCIPAL”), and _____ (hereinafter referred to as “SURETY”), a corporation organized under the laws of the State of _____ and authorized under the laws of the State of Texas to act as SURETY on bonds for principals, are held and firmly bound unto **City of Frisco, Texas** (hereinafter referred to as “OWNER”) in the penal sum of \$ _____ in lawful money of the United States, for the payment whereof, the said PRINCIPAL and SURETY bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents:

WHEREAS, the PRINCIPAL has entered into a certain Contract with the OWNER, dated the _____ day of _____ 20__, to which said Contract is hereby referred to and made a part hereof and as fully and to the same extent as if copied at length herein for the construction of:

Lebanon Road Improvements and Force Main

NOW, THEREFORE, the condition of this obligation is such, that the bond guarantees the full and proper protection of all claimants supplying labor and material in the prosecution of the Work provided for in said Contract and for the use of each clamant, and that conversely should the PRINCIPAL faithfully perform said Contract and in all respects duly and faithfully observe and perform all and singular the covenants, conditions, and agreements in and by said Contract, agreed to by the PRINCIPAL, and according to the true intent and meaning of said Contract and the claims and specifications hereto annexes, and any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modification to SURETY being hereby waived, then this obligation shall be void; otherwise, to remain in full force and effect. Provided further, that if any legal action is filed on this Bond, venue shall lie in Collin County, Texas.

PROVIDED HOWEVER, that this Bond is executed pursuant to the provisions of Texas Government Code, Chapter 2253, as amended, and Article 7.19-1 of the Insurance Code, as amended, and all liabilities on this bond shall be determined in accordance with the provisions of said articles to the same extent as if they were fully copied at length herein.

SURETY, for value received, stipulates and agrees that the bond shall automatically be increased by the amount of any change order or supplemental agreement which increases the Contract price with or without notice to the SURETY, and that no change, extension of time, alteration, or addition to the terms of the Contract, or to the Work performed thereunder, or the plans, specifications, or drawings accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the Work to be performed thereunder.

The undersigned and designated agent is hereby designated by SURETY herein as the agent resident to whom any requisite notice may be delivered and on whom service of process may be had in matters arising out of such suretyship.

IN WITNESS WHEREOF, the said PRINCIPAL and SURETY have signed and sealed this instrument on this the __ day of _____, 20__.

WITNESS

PRINCIPAL

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

WITNESS

SURETY

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

The Resident Agent of the SURETY for delivery of notice and service of process is:

Name: _____

Address: _____

Phone Number: _____

Note: Date of Bond must NOT be prior to date of Contract.

MAINTENANCE BOND

STATE OF TEXAS §
 §
COUNTY OF COLLIN §

KNOW ALL MEN BY THESE PRESENTS:

THAT _____, a corporation organized and existing under the laws of the State of _____, and fully authorized to transact business in the State of Texas, whose address is _____ of the City of _____, County of _____, State of _____, (hereinafter referred to as “PRINCIPAL”), and _____ (hereinafter referred to as “SURETY”), a corporation organized under the laws of the State of _____ and authorized under the laws of the State of Texas to act as SURETY on bonds for principals, are held and firmly bound unto **City of Frisco, Texas** (hereinafter referred to as “OWNER”) in the penal sum of \$ _____ [100% of Final Contract Amount] in lawful money of the United States, for the payment whereof, the said PRINCIPAL and SURETY bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents:

WHEREAS, the PRINCIPAL has entered into a certain written Contract with the OWNER, dated the ___ day of _____ 20___, to which said Contract is hereby referred to and made a part hereof and as fully and to the same extent as if copied at length herein for the consideration of

Lebanon Road Improvements and Force Main

NOW, THEREFORE, the condition of this obligation is such, that the bond guarantees the full and proper maintenance and repair of the Work herein contracted to be done and performed for a period of two (2) year(s) from the date of final acceptance of the Work under the Contract and PRINCIPAL will do all necessary backfilling that may arise on account of sunken conditions in ditches, or otherwise, and do and perform all necessary Work and repair any defective condition growing out of or arising from the improper laying or construction of same, or on account of any braking of same caused by said CONTRACTOR in construction of same, or on account of any defect arising in any of said Work laid or constructed by said CONTRACTOR or on account of improper excavation or backfilling, it being understood that the purpose of this section is to cover all defective conditions arising by reason of defective materials, Work or labor performed by said CONTRACTOR, then this obligation shall be void; otherwise, to remain in full force and effect; and in case said CONTRACTOR shall fail to do so, it is agreed that the OWNER may do said Work and supply such materials and charge the same against said CONTRACTOR and SURETY on this obligation. Provided further, that if any legal action be filed on this Bond, venue shall lie in Collin County, Texas.

PROVIDED HOWEVER, that said SURETY, for value received, stipulates and agrees that the bond shall automatically be increased by the amount of any change order or supplemental agreement which increases the Contract price with or without notice to the SURETY, and that no change, extension of time, alteration, or addition to the terms of the Contract, or to the Work performed thereunder, or the plans, specifications, or drawings accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the Work to be performed thereunder.

The undersigned and designated agent is hereby designated by SURETY herein as the agent resident to whom any requisite notice may be delivered and on whom service of process may be had in matters arising out of such suretyship.

IN WITNESS WHEREOF, the said **PRINCIPAL** and **SURETY** have signed and sealed this instrument on this the __day of _____, 20__.

WITNESS

PRINCIPAL

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

WITNESS

SURETY

Printed/Typed Name: _____

Title: _____

Company: _____

Address: _____

The Resident Agent of the **SURETY** for delivery of notice and service of process is:

Name: _____

Address: _____

Phone Number: _____

Note: Date of Bond must NOT be prior to date of Contract.

Contractor to Insert Completed Certificate of Liability Insurance (ACORD 25 (2001/08))

Per Form that Follows this Page

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor or other person doing business with local governmental entity

OFFICE USE ONLY

Date Received

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

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

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

1 Name of person doing business with local governmental entity.

2

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

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

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

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

Amended 01/13/2006

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor or other person doing business with local governmental entity

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

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

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

Yes

No

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

Yes

No

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

Yes

No

D. Describe each affiliation or business relationship

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

7

Signature of person doing business with the governmental entity

Date

CONTRACTOR’S AFFIDAVIT OF FINAL PAYMENT AND RELEASE

THE STATE OF TEXAS §
 §
COUNTY OF COLLIN §

KNOW ALL MEN BY THESE PRESENTS:

BEFORE ME, the undersigned authority, on this day personally appeared _____ (“Affidant”), who after being by me duly sworn, deposes, and says that it is _____, a _____ (corporation, partnership, trade name) of _____ County, State of _____, (the “CONTRACTOR”), which said CONTRACTOR was awarded the Contract dated the ____ day of _____, 20____, for the construction of Lebanon Road Improvements and Force Main (the “Work”), for a total consideration of _____ Dollars to be paid to the said CONTRACTOR (the “Contract”), and that Affidant has full power of authority to make this affidavit.

That the City of Frisco, Texas (the “OWNER”) has approved the final estimate on said Work, and that the said CONTRACTOR has fully satisfied and paid any and all claims that may be covered by Texas Government Code, Chapter 2253, as amended, or any other applicable statutes or charter provisions and that all just bills for labor and materials have been paid and discharged by said CONTRACTOR insofar as they pertain to the Work in question.

That in addition to any funds which may have been previously paid by the OWNER, the CONTRACTOR hereby accepts the amount of _____ Dollars as FULL AND FINAL PAYMENT under the aforementioned Contract, and hereby waives and releases any right Affidant and/or the CONTRACTOR may have to pursue claims of any nature against the OWNER arising out of or in any manner connected with the performance of the Work and/or the Contract, including but not limited to claims of third parties that supplied material and/or labor for the Work for or through the CONTRACTOR (“Subcontractors”), as well as claims for delay, additional compensation or for recovery of liquidated damages which may have been withheld by the OWNER. The CONTRACTOR shall defend, hold harmless and indemnify the OWNER from any such claims of such Subcontractors. The CONTRACTOR further releases the OWNER from any claim or liability arising from any act or neglect of the OWNER related to or connected with the Contract. This affidavit is given pursuant to the final payment provisions of the Contract, and shall not be deemed to alter or modify the terms of provisions of said Contract.

By: _____
(Affiant)

(Printed Name)

SUBSCRIBED AND SWORN TO BEFORE ME, this _____ day of _____ A.D. 20_____

[Notary Seal]

By: _____
(Notary Public in and for the State of Texas)

(Printed Name of Notary)

My commission expires: _____

GENERAL CONDITIONS

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GC 1- DEFINITION AND ABBREVIATIONS

1.1 DEFINITIONS

The following words and expressions, or pronouns used in their place, shall *wherever* they appear in this Contract be construed as follows, unless a different meaning is clear from the context:

Approved, Directed, Required, and Words of Like Import: Whenever they apply to the Work or its performance, the words "directed," "required," "permitted," "ordered," "designated," "established," "prescribed" and words of like import used in the contract, specifications or upon the drawings shall imply the direction, requirement, permission, order, designation or prescription of the OWNER; and "approved," "acceptable," "satisfactory" and words of like import shall mean approved by, acceptable to or satisfactory to the OWNER.

Addendum, Bulletin or Letter of Clarification: Any additional contract provisions, or change, revisions or clarification of the Contract Documents issued in writing by the OWNER, to prospective bidders prior to the receipt of bids.

Backfill: embedment and final backfill

Base: a layer of specified material of plan thickness placed immediately below the *pavement* course surfacing.

Bedding: material upon which a pipe rests.

Bid Form: The written and signed offer of the bidder, when submitted on approved proposal forms, to perform the contemplated Work and furnish the necessary material and labor in accordance with the provisions of the plans and specifications, special and general provisions, and all Contract Documents.

Bulletin: see Addendum.

Change Order: A written order to the CONTRACTOR authorizing and directing an addition, deletion or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the contract price or the contract time.

Contract: The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

Contract Documents: Contract Documents are all of the written, printed, typed and drawn instruments that comprise and govern the performance of the Contract as defined herein. The Contract Documents consist of the written agreement setting forth the Work to be performed; advertisement to bidders, instructions to bidders, bid form; addendum, if any; technical specifications; the general and special conditions, plans; any supplemental changes or agreements pertaining to the Work or materials thereof; bonds; and any additional documents incorporated by reference.

Contract Price: The total monies payable to the CONTRACTOR under the terms and conditions of the Contract Documents. When used in such context, it may also mean the unit price of an item of Work under the Contract terms.

Contract Work: Everything expressly or impliedly required to be furnished and done by the CONTRACTOR by anyone or more parts of the Contract Documents, except "Extra Work" as hereinafter defined; it being understood that, in case of any inconsistency between any part or parts of this Contract, the OWNER shall determine which shall prevail in accordance with "*GC 4.1-Contract Documents*" hereof.

CONTRACTOR: The person, persons, partnership, firm, corporation, association or organization, or any combination thereof, as an independent contractor entering into the Contract for the execution of the Work, acting directly or through a duly authorized representative.

Other CONTRACTORS: Any contractor, other than the CONTRACTOR or its subcontractors, who has a direct contact with the OWNER for Work on or adjacent to the site of the Work.

Days or Calendar Days: Any successive days of the week or month, no days being excepted.

Drawings or Contract Drawings: Only those drawings specifically entitled as such and as specified in the Contract, or in any bulletin, or any detailed drawing furnished by the OWNER, pertaining or supplemental thereto.

Engineer: The Engineer or its duly authorized representative means the Engineer of the OWNER, who is the Engineer of Record of the Contract Documents, and nothing contained in the Contract Documents shall create any contractual or agency relationship between the Engineer and the CONTRACTOR.

Equal: Materials, articles or methods which are of equal or higher quality than those specified or shown on the drawings and as further defined in "*GC 5.1-Substitution of Materials*", as determined by the OWNER in his or her sole discretion.

Extra Work: Work other than that which is expressly or impliedly required by the Contract Documents at the time of the execution of the Contract. The OWNER shall be the only entity that may approve Extra Work.

Inspector: Any representative of the OWNER designated to inspect the Work.

Letter of Clarification: see Addendum.

Maintenance Bond: A bond executed by a corporate surety in accordance with Article 7.19-1, Vernon's Texas Insurance Code, in the amount specified in the Contract guaranteeing the prompt, full and faithful performance of the general guaranty and warranty contained in the Contract Documents.

Major Item: A major item is any line item of the Work to be performed which amounts to 5 percent or more of the total Contract amount.

Material Man or Supplier: Any subcontractor contracting with the CONTRACTOR, or any of its subcontractors, to fabricate or deliver or who actually fabricates or delivers, materials, supplies or equipment to be consumed or incorporated into the Work.

Notice: Written notice effective the date of the postmark thereon, or if hand delivered, effective the date of hand delivery, or if electronically delivered, effective as described in "*GC 4.8-Service of Notices*".

OWNER or CITY: The term OWNER or CITY means the City of Frisco or its authorized representative(s).

OWNER'S Representative: The Engineer or other duly authorized assistant, agent, Engineer, inspector or superintendent acting within the scope of the particular duties instructed to him or her.

Partial Release: The CONTRACTOR may be required to provide partial releases, beginning with the second payment application, from subcontractors and suppliers who have received funds from previous partial payments to the CONTRACTOR.

Payment Bond: A bond executed by a corporate surety in accordance with Article 7.19-1, Texas Insurance Code and Chapter 2253, Texas Government Code, in the amount of the Contract, solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the CONTRACTOR or a subcontractor to supply public Work labor or material.

Performance Bond: A bond executed by a corporate surety in accordance with Article 7.19-1, Texas Insurance Code and Chapter 2253, Texas Government Code, in the amount of the Contract, solely for the protection of the OWNER, conditioned on the faithful performance of the Work in accordance with the plans, specifications, and Contract Documents.

Plan or Plans: The plans are the drawings or reproductions therefrom made by or approved by the OWNER showing in detail the location, dimension and position of the various elements of the project, including such profiles, typical cross-sections, layout diagrams, working drawings, preliminary drawings and such supplemental drawings as the OWNER may issue to clarify other drawings or for the purpose of showing changes in the Work hereinafter authorized by the OWNER. The plans are usually bound separately from the other parts of the Contract Documents, but they are part of the Contract Documents just as though they were bound therein.

Plan Quantity Item and Measurement: A plan quantity item is an item, the quantity of which can be accurately determined through calculation, such as length of pipe or square yards of concrete for pavement. Unless otherwise shown in the Contract, the estimated plan quantity amounts shall be the final quantity amounts for payment purposes. Contract adjustments may be made if the actual measured quantity varies by more than 5% from the total estimated plan quantity amount. Either the OWNER or the CONTRACTOR may initiate this adjustment. If the adjustment is requested by the CONTRACTOR the CONTRACTOR must obtain field measurements and calculations justifying the revised quantity. If the adjustment is made by the OWNER, the revised quantity will constitute the final quantity which payment will be made. If the revised quantity significantly changes the character of the Work under the Contract, a Change Order may be issued.

Project Manual: The documentary information prepared for bidding and constructing the Work.

Schedule: A document indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any milestones specified in the Contract Documents.

Schedule of Values: When required under the Contract Documents, a schedule, prepared and maintained by the CONTRACTOR, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Payment Applications.

Site: The area upon or in which the CONTRACTOR'S operations are carried on, and such other areas adjacent thereto as may be designated as such by the OWNER.

Special Conditions: The special clauses of the Contract, setting forth conditions or requirements peculiar to the specific project involved, supplementing the General Conditions and taking precedence over any

conditions or requirements of the General Conditions with which they are in conflict.

Specifications or Technical Specifications: Define the requirements for products, materials, and workmanship upon which the Contract is based.

Subbase: a layer of specified material of plan thickness between a base and a subgrade.

Subcontractors: Any persons, firm or corporation, other than employees of the CONTRACTOR, who or which contracts with the CONTRACTOR to furnish, or who actually furnishes, labor and/or materials and equipment at or about the site.

Subgrade: that portion of the roadbed upon which the subbase, base or the pavement is to be placed.

Sureties: The corporate bodies which are bound by such bonds as are required with and for the CONTRACTOR. The sureties engage to be responsible for the entire and satisfactory fulfillment of the Contract and for any and all requirements as set out in the specifications, Contract or plans. In order for a surety to be acceptable, the surety shall conform to the requirements of Article 7.19-1, Texas Insurance Code and any other requirements of the Contract Documents.

Work: All Work including the furnishing of all labor, materials, tools, equipment, required submittals and incidentals to be performed by the CONTRACTOR under the terms of the Contract.

Working Time, Completion Time or Contract Time: The time set forth in the Contract for the performance and completion of the Work contracted for. The time may be expressed as calendar days, working days or a specific date.

Working Day: A working day is defined as a calendar day not including Saturdays, Sundays or those legal holidays as specified in the list prepared by the OWNER for contract purposes, in which weather or other conditions not under the control of the CONTRACTOR shall permit the performance of the principal units of Work underway for a continuous period of not less than seven hours between 7am and 6pm. A principal unit of Work shall be that unit which controls the completion time of the Contract. No Work will be allowed during weekends without written permission. No credit will be given for delays due to weather or holidays.

1.2 ABBREVIATIONS AND ACRONYMS

Wherever the abbreviations defined herein occur on the plans, in the specifications, Contract, bonds, advertisement, proposal or in any other document or instrument herein contemplated or to which the specifications apply or may apply, the intent and meaning shall be as follows:

%	Percent
'	Foot or Feet
“	Inch or Inches
#	Pound or pounds
AASHTO	American Association of State Highway and Transportation Officials
ABA	American Bankers Association
ACI	American Concrete Institute
am, a.m.	Before noon
ANSI	American National Standards Institute
Asph.	Asphalt Assn. Association
ASME	American Society of Mechanical Engineers

ASTM	American Society for Testing and Materials
APWA	American Public Works Association
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
B _c	Outside diameter of Pipe
B _d	Trench width
BL	Base Line
C	Centigrade
cc	Cubic Centimeter
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CI	Cast Iron
CL	Center Line
cm	Centimeter
CO	Cleanout
C.O.C.	Cleveland Open Cup
Conc.	Concrete
Cond.	Conduit
Corr.	Corrugated
Cu.	Cubic
Culv.	Culvert
CY,C.Y.	Cubic Yard
D	Inside Diameter
DI	Ductile Iron
Dia.	Diameter
Dr.	Driveway
Elev.	Elevation
F	Fahrenheit
fps	Feet per second
Ft.	Foot or Feet
Gal.	Gallon
g, gm	Gram
HDPE	High Density Polyethylene
HP	Horsepower
Hr.	Hour
ID	Inside Diameter
in.	Inch or Inches
ISSA	International Slurry Surfacing Association
Kg or kg	Kilogram
kPa	Kilopascals
L	Liter
Lb.	Pound or Pounds
LDPE	Low Density Polyethylene
LF.	Linear foot or feet
Lin.	Linear
LL	Liquid Limit
LLDPE	Linear Low Density Polyethylene
LMDPE	Linear Medium Density Polyethylene
LOI	Loss on Ignition
M	Meter

Max.	Maximum
MH	Manhole
Min.	Minimum or Minute
M.J.	Mechanical Joint
Mm	Millimeter
Mod.	Modified
Mono.	Monolithic
mph	Miles per hour
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
MPa	Megapascal
MUTCD	(Texas) Manual on Uniform Traffic Control Devices
NACE	National Association of Corrosion Engineers
Nat'l	National
NCTCOG	North Central Texas Council of Governments
NEMA	National Electrical Manufacturers Association
No.	Number
N.P.T.	National Pipe Thread
NRMCA	National Ready-mixed Concrete
NSF	National Sanitation Foundation
o.d., OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
oz.	Ounce
PI, P.I.	Plasticity Index
pm, p.m.	Afternoon
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
PVCO	Molecularly Oriented PVC `
R	Radius
RAP	Recycled/Reclaimed Asphalt Pavement
RCP	Reinforced Concrete Pipe
RCRA	Resource Conservation and Recovery Act
Reinf.	Reinforced or reinforcing
Rem.	Remove
Rep.	Replace
R/W, ROW	Right-of-Way
Sani.,	San. Sanitary
Sec.	Second
S.F.	Saybolt Furol (Viscosity)
Sq.	Square
SSPC	The Society for Protective Coatings [formerly Steel Structures Painting Council]
St.	Street or Storm
Std.	Standard
Str.	Strength
SWPPP	Storm Water Pollution Prevention Plan
SY	Square Yard
TAC	Texas Administrative Code
Tex-###-X	Refer to TxDOT <i>Manual of Testing Procedures</i>
TCEQ	Texas Commission on Environmental Quality [formerly Texas Natural Resource Conservation Commission (TNRCC)]
TMUTCD	Texas Manual on Uniform Traffic Control Devices
TxDOT	Texas Department of Transportation

TxDOT Item #	Refer to current TxDOT <i>Standard Specifications for Construction of Highways, Streets and Bridges</i>
UL	Underwriter's Laboratory
um,µm	Micrometers
US, U.S.	United States
U.S.A.C.E.	United States Army Corps of Engineers
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
Vert.	Vertical
Vol.	Volume
Wt.	Weight
Yd.	Yard

GC 2- AWARD AND EXECUTION OF CONTRACT

2.1 CONTRACTOR'S WARRANTIES AND UNDERSTANDING

In consideration of, and to induce the award of this Contract to it, the CONTRACTOR represents and warrants:

- (1) that it is financially solvent, and sufficiently experienced and competent to perform the Work;
- (2) that the facts stated in the proposal and the information given by it pursuant to the bidding documents are true and correct in all respects;
- (3) that it has read, understood and complied with all the requirements set forth in the bidding documents;
- (4) that it is familiar with and understands all laws and regulations applicable to the Work; and
- (5) unless otherwise specifically provided for in the Contract Documents, the CONTRACTOR shall do all the Work and shall furnish all the tools, equipment, machinery, materials, labor and appliances, except as herein otherwise specified, necessary or proper for performing and completing the Work required by this Contract, in the manner and within the time herein prescribed.

By executing the Contract, the CONTRACTOR represents that it has visited the site of Work, has fully familiarized itself with the local and on-site conditions under which the Work is to be performed and has correlated its observation with the requirements of the Contract Documents. In addition, the CONTRACTOR represents that it has satisfied itself as to subsurface conditions at the site of the Work. Information, data and representations contained in the Contract Documents pertaining to the conditions at the site, including subsurface conditions, are for information only and are not warranted or represented in any manner to accurately show the conditions at the site of the Work. The CONTRACTOR agrees that it shall make no claims for damages; additional compensation or extension of time against the OWNER because of encountering actual conditions in the course of the Work, which vary or differ from conditions or information, contained in the Contract Documents. Except as provided in "GC 6.23 Existing Structures, Facilities and Appurtenances", all risks of differing subsurface conditions shall be borne solely by the CONTRACTOR.

2.2 AWARD OF CONTRACT

The OWNER will make its best attempt to award the Contract within 60 days after the opening of bids. The award, if made, shall be to the lowest responsible bidder; but in no case shall the award be made until after investigations are made as to the responsibility of the bidder to whom it is proposed to award the Contract. If awarded the Contract, the bidder shall execute the Contract and furnish the required bonds and evidence of insurance within ten (10) days of the written Notice of Award.

2.3 SURETY BONDS

2.3.1 CONTRACTOR Surety Bonds. With the execution and delivery of the Contract, the CONTRACTOR shall furnish and file with the OWNER in the amounts herein required, the surety bonds specified hereunder. Without exception, the OWNER'S bond forms must be used, and exclusive venue for any lawsuit in connection with such bonds shall be specified as Collin County. Such surety bonds shall be in accordance with the provisions of Texas Government Code, Chapter 2253, as amended, and Article

7.19-1 of the Insurance Code, as amended. The surety company underwriting the bonds shall be acceptable according to the latest list of companies holding certificates of authority from the US Treasury's Listing of Approved Sureties. These bonds shall automatically be increased by the amount of any change order or supplemental agreement which increases the Contract price with or without notice to the surety, but in no event shall a change which reduces the Contract amount reduce the penal amount of such bonds. The performance and payment bond forms are included in the Contract Documents.

2.3.1.1 Performance Bond. A good and sufficient bond in an amount not less than 100-percent of the approximate total amount of the Contract, as evidenced by the bid tabulation, or, conditioned on the faithful performance of the Work in accordance with the plans, specifications and Contract Documents, including performance of any guarantees or warranties required by OWNER, and including any extensions thereof, for the protection of the OWNER. This bond shall provide for the repair and/or replacement of all defects due to faulty materials and workmanship that appear within a period of one year from the date of completion and acceptance of the improvement by the OWNER or such lesser or greater period as may be designated in the Contract Documents.

2.3.1.2 Payment Bond. A good and sufficient bond in an amount not less than 100-percent of the approximate total amount of the Contract, as evidenced by the proposal tabulation, or otherwise solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the CONTRACTOR or a subcontractor to supply public Work labor or material.

2.3.1.3 Additional or Substitute Bonds. If at any time the OWNER is or becomes dissatisfied with any surety on a performance or payment bond, the CONTRACTOR shall, within five (5) days after notice from the OWNER to do so, substitute an acceptable bond (or bonds), or provide an additional bond, in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such bonds shall be paid by the CONTRACTOR without recourse to the OWNER. No further payments under the Contract shall be deemed due or payable until the substitute or additional bonds have been furnished to and accepted by the OWNER.

2.3.2 Sureties. No sureties shall be accepted by the OWNER who are now in default or delinquent on any bonds or who are interested in any litigation against the OWNER. All bonds shall meet the applicable requirements of Article 7.19-1, Texas Insurance Code and Chapter 2253, Texas Government Code, shall be made on forms furnished by the OWNER, and shall be executed by not less than one corporate surety authorized to do business in the State of Texas and acceptable to the OWNER. The Texas Insurance Board can be contacted at 800-578-4677. The surety company underwriting the bonds shall be licensed to do business in the State of Texas and acceptable according to the latest list of companies holding certificates of authority from the US Treasury's Listing of Approved Sureties. Each bond shall be executed by the CONTRACTOR and surety. Each surety shall designate on the bond the name, address and phone number of a representative for the surety located in a county of the State of Texas acceptable to the OWNER to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship. The OWNER reserves the right to reject any and all sureties.

2.4 INSURANCE

Any insurance policies required under this "GC 2.4-Insurance", may be written in combination with any of the others, where legally permitted, but none of the specified limits may be lowered thereby.

2.4.1 CONTRACTOR'S Insurance. Without limiting any of the other obligations or liabilities of the CONTRACTOR, during the term of the Contract the CONTRACTOR and each subcontractor at its own expense shall purchase and maintain the herein stipulated minimum insurance with companies duly approved to do business in the State of Texas and satisfactory to the OWNER. A certified copy of each policy shall be delivered to the OWNER before any Work is started, along with a written statement from the issuing company stating that said policy shall not be canceled, nonrenewed or materially changed without 30 days advance written notice being given to the OWNER, except when the policy is being canceled for nonpayment of premium, in which case 10 days advance written notice is required. Prior to the effective date of cancellation, the CONTRACTOR must deliver to the OWNER a replacement certified copy of each policy of insurance or proof of reinstatement. Coverage shall be of the following types and not less than the specified amounts:

2.4.1.1 Workers' Compensation. Workers' compensation as required by Texas law, with the policy endorsed to provide a waiver of subrogation as to the OWNER; employer's liability insurance of not less than \$100,000 for each accident, \$100,000 disease -each employee, \$500,000 disease -policy limit.

2.4.1.2 Commercial General Liability. Commercial general liability insurance, including independent CONTRACTOR'S liability, completed operations and contractual liability, covering, but not limited to, the liability assumed under the indemnification provisions of this Contract, fully insuring CONTRACTOR'S (or subcontractor's) liability for injury to or death of OWNER'S employees and third parties, extended to include personal injury liability coverage with damage to property of third parties, with minimum limits as set forth in *Table 2.4.1.2(a) General Liability Insurance Minimum Coverage*.

The policy shall include coverage extended to apply to completed operations, asbestos hazards (if this project involves Work with asbestos) and XCU (explosion, collapse and underground) hazards. The completed operations coverage must be maintained for a minimum of one year after final completion and acceptance of the Work, with evidence of same filed with OWNER.

Table 2.4.1.2(a) General Liability Insurance Minimum Coverage

General Aggregate	\$ 3,000,000
Products-Components/Operations Aggregate	\$ 2,000,000
Personal and Advertising Injury	\$ 1,000,000
Each Occurrence	\$ 1,000,000
Fire Damage (any one fire)	\$ 100,000
Medical Expense (any one person)	\$ 10,000

2.4.1.3 Automobiles. Comprehensive automobile and truck liability insurance, covering owned, hired and non-owned vehicles, with a combined bodily injury and property damage minimum limit of \$1,000,000 per occurrence; or separate limits of \$250,000 for bodily injury (per person), \$500,000 for bodily injury (per accident) and \$100,000 for property damage. Such insurance shall include coverage for loading and unloading hazards.

2.4.2 OWNER'S Protective Liability Insurance. CONTRACTOR shall obtain, pay for and maintain at all times during the prosecution of the Work under this Contract an OWNER'S protective liability insurance policy naming the OWNER and the Engineer as insureds for property damage and bodily injury, which may arise in the prosecution of the Work or CONTRACTOR'S operations under this Contract. Coverage shall be on an "occurrence" basis, and the policy shall be issued by the same insurance company that carries the CONTRACTOR'S liability insurance with a combined bodily injury and property damage minimum limit of \$1,000,000 per occurrence and \$2,000,000 aggregate.

2.4.3 "Umbrella" Liability Insurance. If required by OWNER, CONTRACTOR shall obtain, pay for and maintain umbrella liability insurance during the Contract term, insuring CONTRACTOR for an amount of not less than \$3,000,000 per occurrence combined limit for bodily injury and property damage that follows form and applies in excess of the primary liability coverages required hereinabove. The policy shall provide "drop down" coverage where underlying primary insurance coverage limits are insufficient or exhausted. OWNER and Engineer shall be named as additional insureds.

2.4.4 Railroad Protective Insurance. When required in the Special Conditions, CONTRACTOR shall obtain, maintain and present evidence of railroad protective insurance (RPI). The policy shall be in the name of the railroad company having jurisdiction over the right-of-way involved. The minimum limit of coverage shall meet the specifications provided by the railroad company. The OWNER shall specify the amount of RPI necessary in the Special Conditions.

2.4.5 Policy Endorsements and Requirements.

2.4.5.1 Endorsements. Each insurance policy to be furnished by CONTRACTOR shall include the following conditions by endorsement to the policy:

- (1) each policy shall name the OWNER and Engineer as an additional insured as to all applicable coverage;
- (2) each policy will endeavor that 30 days prior to the cancellation, nonrenewal or any material change in coverage, a notice thereof shall be given to OWNER by certified mail. If the policy is canceled for nonpayment of premium, only 10 days written notice to OWNER is required;
- (3) the term "OWNER" shall include all authorities, boards, bureaus, commissions, divisions, departments and offices of the OWNER and individual members, employees and agents thereof in their official capacities and/or while acting on behalf of the OWNER;
- (4) the policy phrase "other insurance" shall not apply to the OWNER where the OWNER is an additional insured on the policy; and
- (5) all provisions of the Contract concerning liability, duty and standard of care together with the indemnification provision, shall be underwritten by contractual liability coverage sufficient to include such obligations within applicable policies.

2.4.5.2 Insurance Requirements. Insurance furnished by the CONTRACTOR shall be in accordance with the following requirements:

- (1) any policy submitted shall not be subject to limitations, conditions or restrictions deemed inconsistent with the intent of the insurance requirements to be fulfilled by the CONTRACTOR. The OWNER'S decision thereon shall be final;
- (2) all policies are to be written through companies duly licensed to transact that class of insurance in the State of Texas; and
- (3) all liability policies required herein shall be written with an "occurrence" basis coverage trigger.

2.4.5.3 CONTRACTOR Agreements. CONTRACTOR agrees to the following:

- (1) CONTRACTOR hereby waives subrogation rights for loss or damage to the extent same are covered by insurance. Insurers shall have no right of recovery or Subrogation against the OWNER, it being the intention that the insurance policies shall protect all parties to the Contract and be primary coverage for all losses covered by the policies;
- (2) companies issuing the insurance policies and CONTRACTOR shall have no recourse against the OWNER for payment of any premiums or assessments for any deductibles, as all such premiums and deductibles are the sole responsibility and risk of the CONTRACTOR;
- (3) approval, disapproval or failure to act by the OWNER regarding any insurance supplied by the CONTRACTOR (or any subcontractors) shall not relieve the CONTRACTOR of full responsibility or liability for damages and accidents as set forth in the Contract Documents. Neither shall the bankruptcy, insolvency or denial of liability by the insurance company exonerate the CONTRACTOR from liability; and,
- (4) no special payments shall be made for any insurance that the CONTRACTOR and subcontractors are required to carry; all are included in the Contract price and the Contract unit prices.

2.5. EXECUTION OF CONTRACT

2.5.1. OWNER and CONTRACTOR Responsibilities. The CONTRACTOR shall within ten (10) business days after receipt of the Contract sign the necessary agreements entering into the required Contract with the OWNER. No Contract shall be binding on the OWNER until all authorized signatures required by law have been affixed and the executed Contract delivered to the CONTRACTOR.

2.5.2 Failure to Execute. The failure of the CONTRACTOR to execute the Contract or provide the required statutory surety bonds within ten (10) business days after the Contract is received shall constitute a breach of its proposal and the OWNER may annul the award and retain the proceeds of the bid security. In the event the OWNER should readvertise for bids, the defaulting CONTRACTOR may not be eligible to bid.

2.6 NOTICE TO PROCEED AND COMMENCEMENT OF WORK

Upon OWNER receipt of the executed Contract and the required insurance and surety bonds, a Notice to Proceed shall be issued by the OWNER indicating the date upon which the Contract time shall start and the projected date of completion. The OWNER will attempt to provide the Notice to Proceed to begin Work within the time specified in the Contract Documents. The CONTRACTOR shall commence Work within ten (10) days from the date specified in the written Notice to Proceed. No Work shall commence before the Notice to Proceed has been issued.

2.7 DELAY OF CONTRACT

The CONTRACTOR shall not be entitled to any claim for damages due to delay in the award or Notice to Proceed. If the CONTRACTOR encounters any delay occasioned by the OWNER'S failure or inability to obtain right-of-way or is delayed by the relocation or removal of any of the utilities or other installations of similar kind, the CONTRACTOR shall not be entitled to any claim for damages by virtue of any delay.

GC 3 - SCOPE OF WORK

3.1 INTENT OF CONTRACT DOCUMENTS

The intent of the documents, unless otherwise specifically provided, is to produce complete and finished Work, which the CONTRACTOR undertakes to do in full compliance with the Contract Documents. It is not intended to mention every item of Work in the specifications that can be adequately shown on the drawings nor to show on the drawings all items of Work described or required by the specifications or identified as a separate pay item. If no separate pay item is provided in the bid form the Work shall be considered subsidiary to the other pay items. All materials or labor for Work shown on the drawings or reasonably inferable therefrom as being necessary to produce a finished job shall be provided by the CONTRACTOR whether or not same is expressly covered in the specifications. No verbal conversation, understanding or agreement with any officer or employee or agent of the OWNER, either before or after the execution of the Contract, shall affect or modify any of the terms, conditions or obligations contained in the Contract documents.

3.2 CHANGE OR MODIFICATION OF CONTRACT

3.2.1 Increased or Decreased Quantities of Work. The OWNER reserves the right to make changes in the quantities of the Work, as may be considered necessary or desirable, and such changes shall not be considered as waiving or invalidating any conditions or provisions of the Contract or bonds. The CONTRACTOR shall perform the Work as altered, whether increased or decreased, and no allowances shall be made for anticipated profits.

The OWNER reserves the right to decrease the Work under this Contract. Payment to the CONTRACTOR for the Contract items shall be made for the actual quantities of Work performed and material furnished at the unit prices set forth in the Contract, except as provided below.

When the quantity of Work to be done or of materials to be furnished under any major item of the Contract is more than 125 percent of the quantity stated in the Contract, then either party to the Contract, upon demand, shall be entitled to negotiate for revised consideration on the portion of Work above 125 percent of the quantity stated in the Contract.

When the quantity of Work to be done or of materials to be furnished under any major item of the Contract is less than 75 percent of the quantity stated in the Contract, then either party to the Contract, upon demand, shall be entitled to negotiate for revised consideration on the Work performed. The CONTRACTOR will not be entitled to any potential restocking fees or charges.

Any revised consideration shall be paid for as is hereinafter provided under “GC 8.3-Payment for Extra Work.” The foregoing notwithstanding, the total original Contract amount shall not be increased more than 25 percent; the CONTRACTOR, by submission of a bid and execution of the Contract, is deemed to consent to the OWNER'S right to reduce the total original Contract amount by more than 25 percent.

3.2.2 Alteration of Plans and Specifications. The OWNER reserves the right to make such changes in the plans and specifications and in the character of the Work as may be necessary or desirable to insure completion in the most satisfactory manner, provided such changes do not materially alter the original plans and specifications or change the general nature of the Work as a whole. Such changes shall not be considered as waiving or invalidating any condition or provision of the Contract and bonds. Such changes shall be issued by the OWNER.

3.2.3 Extra Work. When any Work is necessary to ensure the proper completion of the Work and for which no prices are provided for in the Bid Form and Contract, the CONTRACTOR shall do such Work, but only when and as ordered in writing by the OWNER only after an agreed upon price for such Work is established. Extra Work is further explained in “GC 8.3-Payment for Extra Work” and “GC 3.3-Disputed Work and Claims for Additional Compensation.” Payment for Extra Work shall be made as hereinafter provided in “GC 8.3-Payment for Extra Work.”

3.2.4 Finality of Change Orders. In addition to the OWNER, the CONTRACTOR shall sign the Change Order Documents to verify the terms and conditions established by the Change Order; however, failure or refusal of the CONTRACTOR to sign a Change Order shall not relieve the CONTRACTOR of its obligation to execute the proposed changes in accordance with this condition and the other terms and conditions of this Contract. Each Change Order shall be specific and final as to prices and the extension of time, if any, and no reservations or other provisions allowing for future additional money or time as a result of the particular changes identified and fully compensated in the Change Order.

3.2.5 General Claim Procedures. Except where otherwise provided in the Contract Documents, claims by the CONTRACTOR, whether for damages, additional compensation, additional time or other reasons must be made by written notice to the OWNER within fourteen (14) days after occurrence of the event or events giving rise to the particular claim. Every claim, whether for damages, additional compensation, additional time or other reasons shall be signed and sworn to by an authorized corporate officer (if not a corporation, then an official of the company authorized to bind the CONTRACTOR by his or her signature) of the CONTRACTOR, verifying the truth and accuracy of the claim. Such verification shall be a condition precedent to the acceptability of any claim asserted by the CONTRACTOR. The CONTRACTOR shall be deemed to have waived any claim not made strictly in accordance with the procedure and time limits set out in this paragraph.

3.3 DISPUTED WORK AND CLAIMS FOR ADDITIONAL COMPENSATION

If the CONTRACTOR is of the opinion that:

- (1) certain Work necessary or required to accomplish the result intended by this Contract or certain Work ordered to be done as Contract Work by the OWNER is actually Extra Work and not work under this Contract, or
- (2) any determination or order of the OWNER violates the terms and provisions of this Contract,

then the CONTRACTOR shall promptly, either before proceeding with such Work or complying with such order or determination, notify the OWNER in writing of its contentions with respect thereto and request a final determination by the OWNER. Such determination of the OWNER shall be given in writing to the CONTRACTOR. If the OWNER determines that the Work in question is Extra Work and not Contract Work, or that the order complained of requires performance by the CONTRACTOR beyond that required by the Contract or violates the terms and provisions of the Contract, thereupon the OWNER shall cause either (a) the issuance of a written order covering the Extra Work as provided for in “GC 3.2-Change or Modification of Contract” hereof, or (b) the determination or order complained of to be rescinded or so modified so as to not require performance beyond that required by the terms and provisions of the Contract.

If the OWNER determines that the performance of work in question is Work and not Extra Work, or that the determination or order complained of does not require performance by the CONTRACTOR beyond that required by the Contract or violates the terms and provisions of the Contract, the OWNER shall direct the CONTRACTOR to proceed, and the CONTRACTOR must promptly comply. In order to reserve its

right to claim compensation for such Work resulting from such compliance, however, the CONTRACTOR must, within fourteen (14) days after receiving the OWNER'S determination and direction, notify the OWNER in writing that the Work is being performed, or that the determination and direction is being complied with, under protest. If the OWNER is properly notified of a protest by the CONTRACTOR, then the cost of such disputed Work shall be accounted for in accordance with the force account method described in "GC 8.3.3- Force Account Work." Payment, if any is due, shall be made when the OWNER makes a final determination regarding the merit of the CONTRACTOR'S protest. The final determination of the cost of disputed Work under this method, or of any issue regarding the merits of a protest, is not waived by the OWNER'S issuance of any Change Order providing for the funding of the disputed Work.

If the CONTRACTOR fails to so appeal to the OWNER for a determination or, having so appealed, should the CONTRACTOR thus fail to notify the OWNER in writing of its protest, the CONTRACTOR shall be deemed to have waived any claim for extra compensation of damages therefore. No oral appeals or oral protests, no matter to whom made, shall be deemed even substantial compliance with the provisions of this item.

A delay of the CONTRACTOR due to a court order against the OWNER, or due to the OWNER'S failure to secure right-of-way at the time required or because of a conflict of a utility with the Work, shall not be cause for additional compensation for damages sustained by the CONTRACTOR, but may be a cause for extension of Contract working time only.

In addition to the foregoing requirements, the CONTRACTOR shall, upon notice from the OWNER, produce for examination and audit at the CONTRACTOR'S office, by the representatives of the OWNER, all its books and records showing all of its acts and transactions in connection with contractual performance as well as relating to or arising by reason of the matter in dispute. At such examination a duly authorized representative of the CONTRACTOR may be present.

Unless the aforesaid requirements and conditions shall have been complied with by the CONTRACTOR, the OWNER shall be released from all claims arising under, relating to or by reason of this Contract, except for the sums to be due under the payment provisions of this Contract. It is further stipulated and agreed to that no conduct on the part of the OWNER or any agent or employee of the OWNER shall ever be construed as a waiver of the requirements of this section, when such requirements constitute an absolute condition precedent to any approval or any claim for extra compensation, notwithstanding any other provisions of the Contract Documents; and in any action against the OWNER to recover any sum in excess of the Contract amount, the CONTRACTOR must allege and prove strict compliance with the provisions of this section.

In connection with the examination provided for herein, the OWNER, upon demand therefore, shall also produce for inspection by the CONTRACTOR such records as the OWNER may have with respect to such disputed Work or Work performed under protest pursuant to order of the OWNER, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the CONTRACTOR'S claim.

3.4 PERFORMANCE OF EXTRA OR DISPUTED WORK

While the CONTRACTOR or any subcontractor is performing Extra Work in accordance with "GC 8.3.3- Force Account Work," or is performing disputed Work or complying with a determination or order under protest in accordance with "GC 3.3 Disputed Work and Claims for Additional Compensation," the cost of which shall also be determined by the method set out in "GC 8.3.3-Force Account Work," the CONTRACTOR shall furnish daily the OWNER or representative of the OWNER at the project site with

three copies of verified statements showing:

- (1) the name and number of each worker, foreman, timekeeper, mechanic, or laborer employed on Extra Work or engaged in complying with such determination or order, the character of Extra Work each is doing and the wages paid to him or her, including the rate and amount of payroll taxes, contribution for insurance and federal social security; and
- (2) the nature, cost and quantity of any materials, supplies, tools, plant or construction equipment furnished or used in connection with the performance of the Extra Work or in complying with such determination or order, and from whom purchased or rented.

The above required submittals are in addition to and not in lieu of submittals required under “GC 3.3-*Disputed Work and Claims for Additional Compensation*” and “GC 8.3 *Payment for Extra Work.*” A copy of such statements shall be signed by the OWNER, noting thereon any items in question, and shall be returned to the CONTRACTOR within two (2) working days after submission. This signature shall not be construed as the OWNER'S agreement and acceptance of items not questioned since all items are subject to subsequent review and audit by OWNER.

The CONTRACTOR and its subcontractors, when required by the OWNER, must also produce for inspection and audit by the OWNER, any and all of their books, vouchers, records, daily job diaries and reports, canceled checks, etc. showing the nature and quantity of labor, materials and equipment actually used in the performance of the Extra Work; the amounts expended therefore; and the costs incurred for insurance premiums and other items of expense directly chargeable to such Extra Work. The CONTRACTOR must permit the OWNER to make extracts there from or copies thereof as may be desired.

Failure of the CONTRACTOR to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation on account of the performance of such Extra Work.

GC 4- CONTROL OF WORK

4.1 CONTRACT DOCUMENTS

4.1.1 Priority of Contract Documents. In case of conflict between Contract Documents, priority of interpretation shall be in the following order: signed Standard Construction Contract, Performance and Payment bonds, submitted Bid Form, Special Conditions, General Conditions, Advertisement to Bidders (or Instruction to Bidders), and project (or Contract) drawings, standard drawings, and referenced specifications. See also “GC 4.1.3 Contract Drawings and Specifications,” “GC 4.1.6-Errors and Corrections in Drawings and Specifications”, “GC 3.3-Disputed Work and Claims for Additional Compensation,” and “GC 4.7-OWNER'S Representatives.”

4.1.2 Correlation of Documents. The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all.

4.1.3 Project Manual and Contract Drawings. The OWNER shall furnish the CONTRACTOR, without charge, up to **six (6) copies** of the Project Manual and Contract drawings. At least one (1) copy of all drawings and specifications shall be accessible at all times to the OWNER at the job site.

The plans, the Bid Form, General Conditions, Special Conditions, Technical Specifications, and all supplementary documents are intended to describe a complete Work and are essential parts of the Contract. All requirements occurring in any of them are binding. In cases of discrepancies, figured dimensions shall govern over scaled dimensions; plans shall govern over Technical Specifications, Special Conditions shall govern over both plans and Technical Specifications.

All other conditions of the Contract shall remain in force.

4.1.4 Supplemental Drawings and Specifications. In order to carry out the intent of the Contract Documents and to assist the CONTRACTOR in performing its Work, the OWNER, after the execution of the Contract, may, by supplemental drawings, specifications or otherwise, furnish additional information or instructions as may be necessary for construction purposes.

All such supplemental drawings, specifications or instructions are intended to be consistent with the Contract Documents and reasonably inferable therefrom. Therefore, no extra costs shall be allowed by the OWNER on a claim that particular supplemental drawings, specifications or instructions differ from the requirements of the Contract Documents, incurring extra costs, unless the CONTRACTOR has first brought the matter, in writing, to the OWNER'S attention for adjustment before proceeding with the Work covered by such.

If the OWNER shall decide that there is no departure from the requirements of the Contract Documents, the CONTRACTOR shall then proceed with the Work as shown, specified or directed. If the OWNER shall decide that Extra Work is involved, OWNER shall so modify the supplemental drawings, specifications or instructions to eliminate the extra Work, or cause a written change order to be issued in accordance with “GC 3.2-Change or Modification of Contract” herein.

4.1.5 Referenced Standards. All referenced City, local, State, Federal, and National standards are the most current version in effect, unless specifically noted otherwise. Referenced standards may include, but are not limited to, publications such as TxDOT *Standard Specifications for Construction of Highways, Streets and Bridges*, TxDOT *Manual of Testing Procedures*, Federal Specifications, NCTCOG *Public Works Construction Standards*, ASTM designations, AWWA standards, and standards of other professional societies and associations.

4.1.6 Errors and Corrections in Drawings and Specifications. The Engineer shall be permitted to make such corrections or interpretations as may be necessary for the fulfillment of the intent of the Contract Documents. The CONTRACTOR shall not take advantage of any apparent errors, omissions or discrepancies in the drawings or specifications. In case of any errors, omissions or discrepancies in the drawings or specifications, the CONTRACTOR shall promptly submit the matter to the OWNER who, in turn, shall promptly make a determination and issue the necessary instructions in writing. Any adjustment by the CONTRACTOR without this determination and instructions shall be at the CONTRACTOR'S own risk and expense. The Work is to be made complete as intended by the Contract Documents.

4.2 WORKMANSHIP, WARRANTIES AND GUARANTEES

Unless otherwise expressly provided in the Contract drawings or specifications, the Work shall be performed in accordance with the best modern practice with materials and workmanship of the highest quality and suitable for their purpose. The OWNER shall judge and determine the CONTRACTOR'S compliance with these requirements.

4.2.1 Workmanship. The CONTRACTOR shall promptly correct or replace all Work rejected by the OWNER as defective or as failing to conform to the Contract Documents whether observed before or after substantial completion and whether or not fabricated, installed or completed. The CONTRACTOR shall bear all costs of correcting such rejected Work, including costs incurred for additional services made necessary thereby.

4.2.2 Special Warranty. If within two (2) years after final acceptance of the Work by the OWNER, as evidenced by the final certificate of acceptance any of the Work is found to be defective or not in accordance with the Contract Documents, the CONTRACTOR shall correct it promptly after receipt of a written notice from the OWNER to do so. This obligation shall survive termination of the Contract. The OWNER shall give such notice promptly after discovery of the condition and the CONTRACTOR shall make the necessary repairs within ten (10) days. Should the CONTRACTOR fail to respond within five (5) days, the OWNER may make the necessary repairs and charge the CONTRACTOR with the actual cost of all labor and material required.

The CONTRACTOR shall remove from the site all portions of the Work which are defective or nonconforming and which have not been corrected unless removal is waived in writing by the OWNER.

4.2.3 Subcontractors' and Manufacturers' Warranties. All subcontractors', manufacturers' and suppliers' warranties and guarantees, express or implied, respecting any part of the Work and any materials used therein, shall be obtained and enforced by the CONTRACTOR for the benefit of the OWNER without the necessity of separate transfer or assignment thereof, provided that if directed by the Engineer, the CONTRACTOR shall assign such warranties and guarantees in writing to the OWNER.

4.2.4 Corrected Work Warranty. Any Work repaired or replaced, pursuant to this section, shall be subject to the provisions of this section to the same extent as Work originally performed.

4.2.5 Rights and Remedies. The rights and remedies of the OWNER provided in this section are in addition to, and do not limit, any rights or remedies afforded to the OWNER by law or any other provision of the Contract Documents, or in any way limit the OWNER'S right to recovery of damage due to default under the Contract.

4.3 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Shop drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the

CONTRACTOR or any subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work. Product data or manufacturer's data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the CONTRACTOR to illustrate a material, product or system for some portion of the Work. Samples are physical examples, which illustrate materials, equipment or workmanship and establish standards by which the Work shall be judged.

With reasonable promptness and in such sequence as to cause no delay in the Work or in the Work of the OWNER or any separate contractor, CONTRACTOR shall submit **six (6) copies** of shop drawings, layouts, manufacturer's data and material schedules as may be required by the Engineer for his/her review. Submittals shall be checked by and stamped with the approval of the CONTRACTOR prior to submittal to the Engineer. Such review by the Engineer shall include checking for general conformance with the design concept of the project and general compliance with information given in the Contract Documents. Indicated actions by the Engineer, which may result from his/her review, shall not constitute concurrence with any deviation from the plans and specifications unless such deviations are specifically identified by the method described below, and further shall not relieve the CONTRACTOR of responsibility for errors or omissions in the submitted data. Processed shop drawing submittals are not change orders.

If deviations, discrepancies or conflicts between submittals and the design drawings and/or specifications are discovered, either prior to or after submittals are processed, the design drawings and specifications shall govern. Any deviation from the specified criteria shall be expressly stated in writing in the submittal. The CONTRACTOR shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Engineer's review of shop drawings, product data or samples unless the CONTRACTOR has specifically informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written acceptance to the specific deviation.

The purpose of submittals by the CONTRACTOR is to demonstrate that the CONTRACTOR understands the design concept, and that it demonstrates its understanding by indicating which equipment and materials it intends to furnish and install, and by detailing the fabrication and installation methods it intends to use. The CONTRACTOR shall be responsible for dimensions that are to be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of its Work with that of other trades and satisfactory performance its Work. The CONTRACTOR shall check and verify all measurements and review submittals prior to being submitted, and sign or initial a statement included with the submittal, which signifies compliance with plans and specifications and dimensions suitable for the application. No portion of the Work requiring submission of a shop drawing, product data or sample shall be commenced until the submittal has been approved by the Engineer. All such portions of the Work shall be in accordance with approved submittals.

The CONTRACTOR shall be responsible for delays caused by rejection of the submittal of inadequate or incorrect shop drawings, product data or samples. The CONTRACTOR shall be responsible for providing all copies of reviewed shop drawings necessary for the construction operations. Two (2) copies of the reviewed submittals shall be retained by the CONTRACTOR until completion of the Work and presented to the OWNER in bound form.

4.4 CONSTRUCTION STAKES

Unless otherwise expressly provided in the Contract drawings or specifications, the CONTRACTOR shall set all lines, grades, benchmarks, centerlines and measurements necessary to the proper performance and control of the Work contracted for under these specifications at his/her own expense, utilizing the benchmarks and control points shown in the plans. Such stakes or markings as the OWNER or its

representative may choose to establish either for its own use or the CONTRACTOR'S guidance shall be preserved by the CONTRACTOR until authorized by the OWNER or its representative to be removed. The CONTRACTOR shall be charged for the cost of replacing stakes it has disturbed.

If the Contract drawings or specifications stipulate that the CONTRACTOR is to provide construction stakes, the CONTRACTOR shall provide competent staff or employ a qualified survey firm. After completion of staking, the CONTRACTOR shall furnish survey field notes and cut sheets to the OWNER or its representative for review. However, review of survey field notes and cut sheets shall in no way relieve the CONTRACTOR of liability for incorrectly setting stakes. When not listed as a separate pay item in the Contract, construction staking shall be considered as incidental Work, and the cost thereof shall be included in such pay items as are provided in the Contract.

4.5 MEANS AND METHODS OF CONSTRUCTION

Unless otherwise expressly provided in the Contract drawings or specifications, the means and methods of construction shall be such as the CONTRACTOR may choose; subject, however, to the OWNER'S right to prohibit means and methods proposed by the CONTRACTOR which in the OWNER'S judgment:

- (1) shall constitute a hazard to the Work, or to persons or property, or shall violate express requirements of applicable laws or ordinances; or
- (2) shall cause unnecessary or unreasonable inconvenience to the public; or
- (3) shall not produce finished Work in accordance with the requirements of the Contract Documents; or
- (4) shall not assure the Work to be completed within the time allowed by the Contract.

The OWNER'S approval of the CONTRACTOR'S means or methods of construction, or the OWNER'S failure to exercise OWNER'S right to prohibit such means or methods, shall not relieve the CONTRACTOR of its responsibility for the Work or of its obligation to accomplish the result intended by the Contract Documents; nor shall the exercise or non-exercise of such rights to prohibit create a cause of action for damages or provide a basis for any claim by the CONTRACTOR against the OWNER.

Where the Contract drawings or specifications do not require the use of specific means or methods of construction, sequencing of construction or a specific traffic control plan, the CONTRACTOR shall submit its proposed plan of procedure, sequencing or traffic control plan to the OWNER ten (10) days prior to commencement of the Work to permit a reasonable time for review and comments. The sequence of construction and traffic control plan must be approved in advance by the OWNER before construction begins. Failure to submit the proposed plan within ten (10) days shall not create a claim for damages for resulting delay in the Work or for damages, nor shall it be a cause for extension of working time to complete the Work.

CONTRACTOR further agrees to indemnify OWNER for any cause of action brought by any third party against the OWNER provided for in "*GC 6.2-Indemnification*" hereof.

4.6 SUPERVISION BY CONTRACTOR

The status of the CONTRACTOR is that of an independent contractor under Texas law and the Work under this Contract shall be under the direct charge and superintendence of the CONTRACTOR. Except where the CONTRACTOR is an individual and gives its personal superintendence to the Work, the

CONTRACTOR shall provide a competent superintendent or general foreman on the Work site at all times during progress with full authority to act for CONTRACTOR. The CONTRACTOR shall also provide an adequate staff for the coordination and expediting of its Work.

The superintendent and staff shall be satisfactory to the OWNER. The superintendent or general foreman shall not be changed during this Contract except with the written consent of the OWNER or unless the superintendent or general foreman proves unsatisfactory to the CONTRACTOR and ceases to be in its employ.

If the superintendent or any staff should be or become unsatisfactory to the OWNER, he/she shall be removed by the CONTRACTOR upon written direction of the OWNER, and in such event, the CONTRACTOR shall not be entitled to file a claim for any additional working time or money from the OWNER.

4.7 OWNER'S REPRESENTATIVES

Where the Contract Documents indicate that determinations, directions or approvals shall be made by the OWNER or "OWNER'S representatives," this shall mean the OWNER acting directly, or through duly authorized persons acting within the limit of authority delegated to them.

4.7.1 Authority of the Engineer. The Engineer is not the OWNER'S representative unless specifically designated as such in writing by the OWNER.

4.7.2 OWNER'S Final Determination. The OWNER'S determinations shall be final relative to the proper performance of the Work and the materials used, and the CONTRACTOR is bound thereby.

The OWNER, in consultation with the Engineer, shall decide all questions which arise as to the amount, quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the Work, sequence of the construction, interpretation of the Contract Documents, acceptable fulfillment of the Contract, compensation, mutual rights between contractors under these specifications, and suspension of the Work.

It is hereby covenanted and agreed between the two parties of this Contract that the OWNER shall review and determine all disputes, controversies or claims of either party in relation to this Contract or its performance. Such determination shall be made in writing by the OWNER within a reasonable time and shall be final and conclusive upon both the CONTRACTOR and the OWNER. It is further covenanted and agreed between the two parties to the Contract that the determination by the OWNER shall be a condition precedent to the right of any legal action at law or in equity that either party may have against the other.

4.8 SERVICE OF NOTICES

The OWNER and the CONTRACTOR shall designate an address and, if available, a facsimile number where all notices, directions or other communications may be delivered. If the OWNER and the CONTRACTOR agree in writing, service of notice under this section may be accomplished by e-mail under the same provisions as notice by facsimile.

Notices to the surety or sureties on Contract bonds shall be directed or delivered to the surety's home office or to the surety's designated agent for delivery of notices.

Service by mail shall be presumed complete upon deposit of the paper, enclosed in a postpaid, properly addressed envelope, in a post office or official depository under the care and custody of the United States

Postal Service. Service by facsimile or e-mail after 5:00 p.m. local time of the recipient shall be deemed delivered on the following business day.

A party may change its designated address, facsimile number or e-mail address by delivering written notice of the new address, facsimile number or email address, properly signed, to all interested parties.

Nothing herein contained shall be deemed to preclude hand delivery of any notice, direction or communication to a party mentioned above.

4.9 INSPECTION

All elements of the Work are subject to inspection by the OWNER. CONTRACTOR shall obtain written verification from the OWNER if an inspection is not needed before proceeding with that particular item of Work. The CONTRACTOR must pay for all testing needed to determine acceptability for any Work done without proper inspection, as directed by the OWNER.

The CONTRACTOR shall furnish the OWNER with every reasonable facility for ascertaining whether or not the Work performed was in accordance with the requirements and intent of the plans and specifications. Any Work done or materials used without suitable inspection by the OWNER may be ordered removed and replaced at the CONTRACTOR'S expense. Testing of materials shall be performed by a testing laboratory selected by the CONTRACTOR, and approved by the OWNER.

4.9.1 Removal of Defective and Unauthorized Work. All Work which has been rejected or condemned shall be repaired, or if it cannot be repaired satisfactorily, it shall be removed and replaced at the CONTRACTOR'S expense. Defective materials shall be immediately removed from the site of the Work. Work done without line and grade having been given, Work done beyond the lines or not in conformity with the grades shown on the plans or as given, save as herein provided, Work done without written authority and prior agreement in writing as to process, shall be done at the CONTRACTOR'S risk and shall be considered unauthorized and at the option of the OWNER may not be measured and paid for and may be ordered removed at the CONTRACTOR'S expense. Upon failure of the CONTRACTOR to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized or condemned Work or materials immediately after receiving notice from the OWNER, the OWNER shall, after giving written notice to the CONTRACTOR, have the authority to cause defective Work to be remedied or removed and replaced, or to cause unauthorized Work to be removed and to deduct the cost thereof from any monies due or to become due the CONTRACTOR.

4.9.2 Final Inspection. Whenever the Work provided for by the Contract shall have been completely performed on the part of the CONTRACTOR, the CONTRACTOR shall notify the OWNER that the Work is ready for final inspection. If the Work is not acceptable to the OWNER at the time of such inspection, OWNER shall inform CONTRACTOR as to the particular defects to be remedied before final acceptance shall be made. The OWNER shall make final inspection of all Work included in the Contract as soon as practicable after remedies have been made and the Work is ready for acceptance.

4.9.3 Inspection Overtime. The CONTRACTOR will be required to reimburse the OWNER or its designated representative for the cost of all inspection overtime which may be necessary for the successful and expeditious prosecution of the Work included in this Contract. Requests for overtime inspection must be submitted to the OWNER two working days in advance and on the proper form. Payment to the OWNER or its designated representative for overtime inspection costs will be made within 10 days of receipt of invoice. Failure to submit payment for overtime inspection may result in the OWNER withholding the next monthly partial payment. No additional compensation or time shall be granted the CONTRACTOR for withheld monthly partial payments due to nonpayment of inspector overtime.

In case of disputes, the OWNER'S decision shall be considered final.

4.10 FINAL ACCEPTANCE

Once the Work is satisfactory to the OWNER and completed in accordance with the Contract Documents, and final record drawings have been submitted and accepted by the OWNER, the CONTRACTOR shall be issued a certificate of final acceptance.

4.11 RECORD DRAWINGS

The CONTRACTOR shall as part of this Contract provide one (1) set of record drawings within five (5) days of Final Acceptance to the Engineer. These drawings shall illustrate how the project was constructed in the field. All modifications to the Contract drawings shall be drawn on a set of Contract drawings. No separate pay will be made for providing these documents.

4.12 EXPLOSIVES, BLASTINGS, ETC.:

No explosives shall be used.

GC 5 - CONTROL OF MATERIAL

5.1 SUBSTITUTION OF MATERIALS

The specifications for materials set out the minimum standard of quality that the OWNER believes necessary to procure a satisfactory project. No substitutions will be permitted until the CONTRACTOR has received written permission of the OWNER to make a substitution for the material that has been specified. Requests for substitution shall be made prior to the date of the preconstruction conference.

Where the term "or equal," or "or approved equal" is used, it is understood that if a material, product, or piece of equipment bearing the name so used is furnished it will be approvable, as the particular trade name was used for the purpose of establishing a standard of quality acceptable to the OWNER. If a product of any other name is proposed for use, the OWNER's approval thereof must be obtained before the CONTRACTOR procures the proposed substitute.

Where the term "or equal," or "or approved equal" is not used in the specifications, this does not necessarily exclude alternative items, material, or equipment that may accomplish the intended purpose. However, the CONTRACTOR shall have the full responsibility of proving that the proposed substitution is equal, and the OWNER, shall be the sole judge of the acceptability of substitutions. The provisions of this sub-section as related to "Substitutions" shall be applicable to all sections of these specifications.

Should an authorized substitution require redesign of a portion of the Work or alterations to the plans or specifications in order for the materials, or articles that are to be substituted to be satisfactory, the Engineer shall accomplish such redesigns and alterations. The CONTRACTOR shall bear all reasonable costs associated with redesign and alteration efforts performed by the Engineer.

5.2 MATERIALS AND EQUIPMENT

The CONTRACTOR shall be free to obtain the approved materials, equipment and articles from sources of its own selection. However, if the OWNER finds that the Work shall be delayed or adversely affected in any way because a selected source of supply cannot furnish a uniform product in sufficient quantity and at the time required and a suitable source does exist, or the product is not suitable for the Work, the OWNER shall have the right to require the original source of supply changed by the CONTRACTOR. The CONTRACTOR shall have no claim for extra cost or damage because of this requirement.

The CONTRACTOR warrants to the OWNER that all materials and equipment furnished under this Contract shall be new unless otherwise specified in the Contract Documents and that same shall be of good quality and workmanship, free from faults and defects and in conformance with the Contract Documents. All materials and equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective and shall be promptly repaired or replaced by the CONTRACTOR at the CONTRACTOR'S sole cost upon demand of the OWNER. If required by the OWNER, the CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

5.3 SALVAGEABLE MATERIAL

All salvageable material shall be designated by and remain the property of the OWNER. Any designated salvageable material that is destroyed or damaged due to negligence of the CONTRACTOR shall be replaced with new material by the CONTRACTOR at no expense to the OWNER. Salvage material, unless designated for reuse, shall be returned to a location designated by the OWNER.

5.4 OFF-SITE STORAGE

Payment for costs incurred in storage of materials or equipment away from the project site will not be made by the OWNER unless:

- (1) the OWNER has approved off-site storage in writing; and
- (2) the materials or equipment are stored in a bonded warehouse located in the County approved by the OWNER and identified with the project for which they are stored as evidenced by warehouse receipts and appropriate documents of title.

Storage in facilities of the manufacturer or CONTRACTOR will not be permitted or paid for, unless such storage is expressly approved in writing by the OWNER.

5.5 SAMPLES AND TESTS OF MATERIALS

Unless otherwise stipulated in the Contract Documents, initial testing of all materials, construction items or products incorporated in the Work shall be performed at the direction and expense of the CONTRACTOR, including initial compaction and density tests deemed necessary. Testing of materials shall be performed by a testing laboratory selected by the CONTRACTOR, and approved by the OWNER.

In the event materials, construction items or products incorporated in the Work fail to satisfy the minimum requirements of the initial test, appropriate prove out test shall be made as directed by the OWNER to determine the extent of the failure and to verify that the corrective measures have brought the item up to specification requirements. The cost of all testing necessary to determine the extent of the failure and the adequacy of the corrective measures shall be the responsibility of the CONTRACTOR.

The failure of the OWNER to make any tests of materials shall in no way relieve the CONTRACTOR of its responsibility of furnishing materials conforming to the Contract Documents.

Tests, unless otherwise specified, shall be made in accordance with the latest methods of the American Society for Testing and Materials (ASTM). The CONTRACTOR shall provide such facilities as the OWNER may require for collecting and forwarding samples and shall not use the materials represented by the samples until tests have been made. The CONTRACTOR shall furnish adequate samples without charge. Test materials and samples shall be stored so as to ensure the preservation of their quality and fitness for the Work. If directed by the OWNER, they shall be placed on wooden platforms or other hard, clean surfaces and shall be placed under cover when directed. Stored materials shall be placed and located so as to facilitate prompt inspection.

The inspections and tests made by the OWNER, inspectors, or agents, shall ordinarily be made without cost to the CONTRACTOR unless otherwise expressly specified in the Contract Documents. The CONTRACTOR shall furnish without additional cost to the OWNER such materials for testing as may be reasonably necessary. Retesting after failure to pass tests shall be at the expense of the CONTRACTOR. Should the percentage of rejected material or equipment be unreasonably large, the additional cost of such inspection and tests resulting therefrom shall be borne by the CONTRACTOR. The OWNER shall judge what is extra inspection and shall determine the additional cost incurred thereby and payable by the CONTRACTOR.

5.6 WATER FOR CONSTRUCTION

Water required for initial testing and sterilization of newly installed water facilities will be available from the OWNER, at no cost to the CONTRACTOR, except for water required for retesting. The CONTRACTOR must, however, furnish all pipe, hose, and fittings necessary to obtain the water.

All other water required shall be paid for by the CONTRACTOR at a rate established by the OWNER. Where meters are used, the charge for water will be at the regular established rate; where no meters are used, the charge will be as prescribed by ordinance, or where no ordinance applies payment shall be made on estimates made by the OWNER (Public Works Department).

The CONTRACTOR shall make complete arrangements with the OWNER (Public Works Department) prior to using the water. All pipe used for any purpose shall be clean and sterilized.

5.7 USE OF FIRE HYDRANTS

No person shall open, turn off, interfere with, attach any pipe to, or connect anything to any fire hydrant, stop valve or stop cock, or tap any water main belonging to or being maintained by the OWNER, unless duly authorized to do so by the OWNER (Public Works Department).

GC 6- LEGAL RELATIONS AND CONTRACTOR RESPONSIBILITIES

6.1 CONTRACTOR INDEPENDENCE

While engaged in carrying out and complying with the terms and conditions of this Contract the CONTRACTOR is and shall be an independent CONTRACTOR and shall not with respect to its acts or omissions be deemed an officer, employee or agent of the OWNER. The CONTRACTOR shall not at any time or in any manner represent that it or any of its agents or employees are in any manner agents or employees of the OWNER. CONTRACTOR is and shall remain an independent CONTRACTOR with full, complete and exclusive power and authority to direct, supervise, and control its own employees and subcontractors and to determine the method of the performance of the Work covered under this Contract. The fact that the OWNER or the Engineer shall have the right to inspect or observe CONTRACTOR'S Work during performance and to exercise the other rights and prerogatives expressly reserved to the OWNER or the Engineer under this Contract is not intended to and shall not any time change or affect the status of the CONTRACTOR as an independent CONTRACTOR with respect to the OWNER, the CONTRACTOR'S own employees or any other person, firm or corporation.

Nothing contained in the Contract Documents shall create any contractual or agency relationship between the Engineer and the CONTRACTOR.

6.2 INDEMNIFICATION

CONTRACTOR covenants and agrees to and does hereby indemnify, hold harmless and defend, at its own expense, OWNER, its officers, servants and employees, from and against any and all claims or suits for property loss or damage and/or personal injury, including death, to any and all persons, of whatsoever kind or character, whether real or asserted, arising out of the Work and services to be performed hereunder by CONTRACTOR, its officers, agents, employees, subcontractors, licensees or invitees, whether or not caused, in whole or in part, by the alleged negligence of the officers, servants, employees, of the OWNER. CONTRACTOR likewise covenants and agrees to, and does hereby, indemnify and hold harmless OWNER from and against any and all injuries, damage, loss or destruction to property of OWNER during the performance of any of the terms and conditions of this Contract, whether arising out of, in whole or in part, any and all alleged acts or omissions of officers, servants, or employees of OWNER.

The provisions of this paragraph are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

6.3 OWNER'S OFFICERS, EMPLOYEES OR AGENTS

6.3.1 Claim Against Officers, Employees or Agent of the OWNER. No claim whatsoever shall be made by the CONTRACTOR against any officer, servant, employee or agent of the OWNER for or on account of, anything done or omitted to be done in connection with this Contract.

6.3.2 Financial Interest in Any Contract by OWNER'S Officers, Employees or Agents. CONTRACTOR is hereby advised to comply with the OWNER'S financial interest or comparable policy. If OWNER does not implement a financial interest or comparable policy of its own, provisions of this Item shall govern matters of financial interest.

No officer, servant, employee, or agent of the OWNER shall have a financial interest direct or indirect, in any contract with the OWNER or be financially interested directly or indirectly, in the sale to the OWNER of any land, materials, supplies or services except on behalf of the OWNER as an officer or

employee. Any violation of this article with the knowledge expressed or implied, of the persons, partnership, company, firm, association or corporation contracting with the OWNER shall render the Contract involved voidable by the OWNER.

6.4 VENUE AND GOVERNING LAW

The parties herein agree that this Contract shall be performed in the county of Collin County, and if legal action is necessary in connection therewith, exclusive venue shall lie in this county. The terms and provisions of the Contract documents shall be construed in accordance with the laws and court decisions of the State of Texas.

6.5 NO WAIVER OF LEGAL RIGHTS

Inspection by the Engineer; any order, measurement, quantity or certificate by the Engineer; any order by the OWNER for payment of money; any payment for or acceptance of any Work; or any extension of time or any possession taken by the OWNER shall not operate as a waiver of any provisions of the Contract or any power therein reserved to the OWNER of any rights or damages therein provided. Any waiver of any breach of Contract shall not be held to be a waiver of any other or subsequent breach. The OWNER reserves the right to correct any error that may be discovered in any estimate that may have been paid and to adjust the same to meet the requirements of the Contract Documents. The OWNER reserves the right to recover by process of law sums as may be sufficient to correct any error or make good any deficiency in the Work resulting from such error, dishonesty or collusion by the CONTRACTOR or its agents and the Engineer or assistants, discovered in the Work after the final payment has been made.

Neither final acceptance of the Work nor final payment shall relieve the CONTRACTOR of responsibility for faulty materials or workmanship, and the CONTRACTOR shall promptly remedy any defects due thereto and pay for any damage to other Work resulting therefrom. Likewise, neither final acceptance nor final payment, nor partial or entire use or occupancy of the Work by the OWNER shall constitute acceptance of Work not done in accordance with the Contract Documents or relieve CONTRACTOR of liability with respect to any expressed or implied warranties or responsibility for faulty materials or workmanship, whether same be patently or latently defective.

The OWNER, or any officer or agent thereof, shall not be precluded at any time, either before or after final completion and acceptance of the Work and final payment, from:

- (1) showing the true and correct amount, classifications, quality and character of the Work done and materials furnished by the CONTRACTOR or any other person under this Contract, or
- (2) showing at any time that any determination, return, decision, approval, order, letter, payment or certification is untrue and incorrect or improperly made in any particular, or
- (3) showing that the Work or the materials or any parts thereof do not in fact conform to the Contract requirements; and
- (4) demanding the recovery from the CONTRACTOR of any overpayments made to it, or such damages as the OWNER may sustain by reason of the CONTRACTOR'S failure to perform each and every part of this Contract in strict accordance with its terms; or both.

6.6 SEVERABILITY

In the event a term, condition, or provision in this Contract is determined to be void, unenforceable, or

unlawful by a court of competent jurisdiction, then that term, condition or provision, shall be deleted and the remainder of the Contract shall remain in full force and effect.

6.7 HEADINGS

The title and headings contained in the Contract Documents and the subject organization are used only to facilitate reference, and in no way define or limit the scope of intent of any of the provisions of this Contract.

6.8 OBLIGATION TO PERFORM FUNCTIONS

Any failure or neglect on the part of OWNER, Engineer or inspectors to enforce provisions herein dealing with supervision, control, inspection, testing or acceptance and approval of the Work shall never operate to relieve CONTRACTOR from full compliance with the Contract Documents nor render OWNER liable to CONTRACTOR for money damages, extensions of time or increased compensation of any kind.

6.9 PERFORMANCE OF THE WORK

In addition to those matters elsewhere expressly made the responsibility of the CONTRACTOR, the CONTRACTOR shall have the full and direct responsibility for the performance and completion of the Work under this Contract and for any act or neglect of the CONTRACTOR, its agents, employees or subcontractors. CONTRACTOR shall bear all losses, if any, resulting on account of the amount and character of the Work, or because the conditions under which the Work must be done are different from what CONTRACTOR estimated or anticipated, or because of weather, floods, elements or other causes.

6.10 SUCCESSORS AND ASSIGNS

Subject to the limitations upon assignment and transfer herein contained, this Contract shall be binding upon and inure to the benefit of the parties hereto, their respective successors and assigns.

6.11 SUPERVISION AND CONSTRUCTION PROCEDURES

The CONTRACTOR shall supervise and direct all the Work, using its best skill and attention. CONTRACTOR shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

The CONTRACTOR shall carefully study and compare the Contract Documents and shall at once report to the OWNER any error, inconsistency or omission it may discover. The CONTRACTOR shall perform no portion of the Work at any time without Contract Documents or, where required, approved shop drawings, product data or samples for such portion of the Work.

The CONTRACTOR shall be responsible to the OWNER for the acts and omissions of the OWNER'S employees, subcontractors, and agents, as well as the CONTRACTOR'S employees and subcontractors performing any of the Work under a contract with the CONTRACTOR. The CONTRACTOR shall at all times enforce strict discipline and good order among its employees and shall not employ on the Work site any unfit person or anyone not skilled in the task assigned to him or her.

The CONTRACTOR shall not be relieved from its obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the OWNER in its administration of the Contract, or by inspections, tests or approvals required or performed by persons other than the CONTRACTOR.

6.12 LABOR AND MATERIALS

Unless otherwise provided in the Contract Documents, the CONTRACTOR shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated into the Work.

6.13 EQUAL EMPLOYMENT OPPORTUNITY

During the performance of this Contract the CONTRACTOR agrees as follows:

6.13.1 Nondiscrimination Toward Employees. The CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, age or national origin. The CONTRACTOR shall take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to their race, color, sex, religion, age 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 or applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

6.13.2 Nondiscrimination Employment Practices. The CONTRACTOR shall, in all solicitations or advertisements for employees placed by or on behalf of the CONTRACTOR, state that all qualified applicants shall receive consideration for employment without regard to race, color, religion, sex, national origin or age.

6.13.4 Provisions in Subcontracts. The CONTRACTOR shall include the provisions of this section in all subcontracts pertaining to the Work.

6.14 STATE AND LOCAL SALES AND USE TAXES

The OWNER qualifies for exemption from the state and local sales and use taxes, pursuant to the provisions of Section 151.309 of the Texas Limited Sales, Excise and Use Tax Act. Therefore, the CONTRACTOR shall not pay such taxes that would otherwise be payable in connection with the performance of this Contract.

The CONTRACTOR shall procure from the OWNER and issue an exemption certificate in lieu of the tax on the purchase of:

- (1) all materials, supplies, equipment and other tangible personal property incorporated into the real property being improved; and
- (2) all materials, supplies and other tangible personal property, other than machinery or equipment and its accessories and repair and replacement parts, necessary and essential for the performance of the Contract with the OWNER that is to be completely consumed at the job site.

Tangible personal property necessary and essential for the performance of the Contract includes only such materials, tools and supplies specifically needed and directly used to incorporate tangible personal property into the real estate being improved under the Contract. Overhead supplies and supplies used

indirectly or only incidental to the performance of the Contract with the OWNER are not included in the exemption. Tangible personal property is "completely consumed" if after being used once for its intended purpose it is used up or destroyed. Any exemption certificate issued by the CONTRACTOR is subject to the existing rules and interpretation governing the exemption issued by the Comptroller of Public Accounts of the State of Texas. The OWNER will not make interpretations of the extent or applicability of the exemption in a particular case; if the CONTRACTOR, or any subcontractor or supplier of the CONTRACTOR, has any questions about the extent or applicability of the exemption in specific circumstances, guidance should be sought from the State Comptroller's Office.

Under "reasons said purchaser is claiming this exemption" in the exemption certificate, the CONTRACTOR must name the OWNER and the project for which the equipment, material and supplies are being purchased, leased or rented.

6.15 PATENTS

The CONTRACTOR shall pay all royalties and license fees and shall provide, by suitable legal agreement with the patentee or OWNER, for the use of any design, device, material or process covered by letters, patent or any copyright. The CONTRACTOR shall indemnify, defend, hold and save the OWNER and its officers, employees and agents harmless from all liability and claims for infringement of any patent or copyright.

In the event that any claims, suit or action at law or in equity of any kind whatsoever is brought against the OWNER, or its officers, employees or agents involving any such patents, copyrights or license rights, then the OWNER shall have the right to and may retain from any money due or to become due to the CONTRACTOR such sum deemed necessary by the OWNER for its protection until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished the OWNER.

6.16 COMPLIANCE WITH LAWS

The CONTRACTOR shall fully comply with all local, state and federal laws, including all codes, ordinances and regulations applicable to this Contract and the Work to be done thereunder, which exists or may be enacted later by governmental bodies having jurisdiction or authority for such enactment.

The CONTRACTOR shall secure and pay for all permits and licenses necessary for the execution of the Work and shall fully comply with all their terms and conditions. All Work required under this Contract shall comply with all requirements of law, regulation, permit or license. If the CONTRACTOR finds that there is a variance, it shall immediately report this to the OWNER for resolution.

6.16.1 Storm Water Permit. The CONTRACTOR is responsible for obtaining a Storm Water Discharge Permit that may be required for construction of this project under regulations contained in 40 CFR Part 122, as amended, under the authority of the Clean Water Act, 33 U.S.C. 1251 et seq. These regulations require the filing of a notice of intent to obtain and abide by the general storm water permit for construction activities, including cleaning, grading, and excavation, that disturb the applicable amount of total land area. For permitting information and requirements, contact USEPA Region VI (local office) and Texas Commission on Environmental Quality.

If a permit is required, the CONTRACTOR shall provide measures to control soil erosion sediment and water pollution created by construction operations for the duration of the Contract as directed by the Engineer. These measures shall be in addition to those required of the CONTRACTOR under Technical Specification for Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control.

6.17 SANITARY PROVISIONS

The CONTRACTOR shall establish and enforce among its employees such regulations in regard to cleanliness and disposal of garbage and waste as shall tend to prevent the inception and spread of infectious or contagious diseases and to prevent effectively the creation of a nuisance about the Work on any property either public or private, and such regulations as are required by the OWNER shall be put into immediate force and effect by the CONTRACTOR. The necessary sanitary conveniences for the use of laborers on the Work, properly secluded from public observation, shall be constructed and maintained by the CONTRACTOR in such a manner and at such points as shall be approved by the OWNER, and their use shall be strictly enforced by the CONTRACTOR. All sanitary laws and regulations of the State of Texas and the OWNER'S jurisdiction shall be strictly complied with.

6.18 PUBLIC CONVENIENCE AND SAFETY

Materials stored about the Work site shall be so placed, and the Work shall at all times be so conducted, as to cause no greater obstruction to the traveling public than is considered necessary by the OWNER. The CONTRACTOR shall make provisions by bridges or otherwise at all cross streets, highways, sidewalks and private driveways for the free passage of pedestrians and vehicles, provided that where bridging is impracticable or unnecessary, in the opinion of the OWNER, the CONTRACTOR may make arrangements satisfactory to the OWNER for the diversion of traffic and shall, at its own expense, provide all material and perform all Work necessary for the construction and maintenance of roadways and bridges for the diversion of traffic. Sidewalks must not be obstructed except by special permission of the OWNER. The materials excavated, and the construction materials or plants used in the construction of the Work, shall be placed so as not to endanger the Work or prevent free access to all fire hydrants, water valves, gas valves, manholes, utility riser, control boxes, junction boxes, or electric conduits, sanitary sewers and fire alarm or police call boxes in the vicinity.

The OWNER reserves the right to remedy any neglect on the part of the CONTRACTOR as regards to the public convenience and safety which may come to its attention, after 24 hours' notice in writing to the CONTRACTOR, save in cases of emergency, when it shall have the right to remedy any neglect without notice; and in either case, the cost of such Work done by the OWNER shall be deducted from the monies due or to become due the CONTRACTOR. The CONTRACTOR 48 hours in advance shall notify the OWNER when any street is to be closed or obstructed. The CONTRACTOR shall, when directed by the OWNER, keep any street or streets in condition for unobstructed use by emergency services. Where the CONTRACTOR is required to construct temporary bridges or to make other arrangements for crossing over ditches or streams, its responsibility for accidents shall include the roadway approaches, as well as the structures of such crossings.

Where the Work passes over or through private property, the OWNER shall provide such right-of-way. The CONTRACTOR shall notify the proper representatives of any public utility, corporation, any company or individual, not less than 48 hours in advance of any Work which might damage or interfere with the operation of property along or adjacent to the Work. The CONTRACTOR shall be responsible for all damage or injury to property of any character (except such as may be required by the provisions of the Contract Documents or caused by agents or employees of the OWNER) by reason of any negligent act or omission on the part of the CONTRACTOR, its employees, agents or subcontractors, or at any time due to defective Work or materials, or due to its failure to reasonably or properly prosecute the Work, and said responsibility shall not be released by the fact that the Work shall have been completed and accepted.

When and where any such damage or injury is done to public or private property on the part of the CONTRACTOR, restoration shall be completed according to "*GC 6.26 Restoration of Property.*"

6.19 PROTECTION OF WORK AND OF PERSONS AND PROPERTY

6.19.1 Protection of Work. During performance and up to date of final acceptance, the CONTRACTOR shall be under the absolute obligation to protect the finished Work against any damage, loss or injury. In the event of such damage, loss or injury, the CONTRACTOR shall promptly replace or repair such Work, whichever the OWNER shall determine to be preferable. The obligation to deliver finished Work in strict accordance with the Contract prior to final acceptance shall be absolute and shall not be affected by the OWNER'S approval of or failure to prohibit means and methods of construction used by the CONTRACTOR. All risk of loss or damage to the Work shall be borne solely by the CONTRACTOR until final completion and acceptance of all Work by the OWNER, as evidenced by the OWNER'S issuance of a certificate of final acceptance.

6.19.2 Protection of Persons and Property. The CONTRACTOR shall have the responsibility to provide and maintain all warning devices and take all precautionary measures required by law or otherwise to protect persons and property while said persons or property are approaching, leaving or within the Work site or any area adjacent to said Work site. Compensation shall be paid to the CONTRACTOR for the installation or maintenance of any warning devices, barricades, lights, signs or any other precautionary measures required by law or otherwise for the protection of persons or property.

The CONTRACTOR shall assume all duties owed by the OWNER to the general public in connection with the general public's immediate approach to and travel through the Work site and the area adjacent to said Work site.

Where the Work is carried on, in or adjacent to any street, alley, sidewalk, public right-of-way or public place, the CONTRACTOR shall at its own cost and expense provide such flaggers and watchmen in addition to its responsibility to furnish, erect and maintain such warning devices, barricades, lights, signs, and other precautionary measures for the protection of persons or property as are required by law. During periods when schools are in session, the CONTRACTOR will be required during the construction of the Work to:

- (1) Maintain a suitable all-weather footpath across the Work at all designated school crosswalks.
- (2) Move and reinstall pedestrian crossing warning signs as construction and routing of traffic lanes require.

The CONTRACTOR'S responsibility for providing and maintaining flaggers, watchmen, warning devices, barricades, signs, and lights, and other precautionary measures shall not cease until directed in writing by the OWNER or until final payment, whichever occurs first. If the OWNER discovers that the CONTRACTOR has failed to comply with the applicable federal and state law by failing to furnish the necessary flaggers, warning devices, barricades, lights, signs or other precautionary measures for the protection of persons or property, the OWNER may order such additional precautionary measures as required by law to be taken to protect persons and property. The CONTRACTOR shall reimburse the OWNER for any expense incurred by the OWNER in taking any additional precautionary measures as a result of the CONTRACTOR'S failure to do so.

In addition, the CONTRACTOR will be held responsible for all damage to the Work and other public or private property due to the failure of warning devices, barricades, signs, lights, or other precautionary measures in protecting said property, and whenever evidence is found of such damage, the OWNER may order the damaged portion immediately removed and replaced by and at the cost and expense of the CONTRACTOR.

Minimum standards for safeguarding pedestrian and vehicular traffic are contained in the current *Texas Manual of Uniform Traffic Control Devices (TMUTCD)*, as amended, Texas Department of Transportation (TxDOT). Signage, barricades and other traffic control devices for detouring and maintenance of traffic on this Contract shall be as provided in above said manual and as directed by the OWNER. Costs associated with the acquisition and removal of required traffic control devices shall be considered incidental to the Work.

6.19.3 Trench Safety.

6.19.3.1 Regulations. The CONTRACTOR shall be responsible for complying with state laws and federal regulations relating to trench safety, including those which may be enacted during the performance under this Contract. The CONTRACTOR is advised that Federal Regulations 29 C.F.R. 1926.650-1926.652 have been, in their most recent version as amended, in effect since January 2, 1990.

THE CONTRACTOR SHALL FULLY COMPLY WITH THE U. S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS PERTAINING TO EXCAVATIONS, TRENCHING, AND SHORING AND SHALL PROVIDE AND FAMILIARIZE ITS EMPLOYEES INVOLVED IN EXCAVATION AND TRENCHING WITH THE PROVISIONS IN OSHA PAMPHLET NUMBER 2226, EXCAVATING AND TRENCHING OPERATIONS.

6.19.3.2 Indemnification. *In addition to any other indemnification, CONTRACTOR agrees to defend, indemnify and hold OWNER, its officers, servants, agents and employees, completely harmless from any claims, lawsuits, judgments, costs and expenses (including attorney's fees, if any) for any personal injury (including death), property damage or other harm for which recovery of damages is sought (including any injury, death or damage suffered by the CONTRACTOR'S own employees) arising out of or occasioned by the use of any trench excavation plans, regardless of their origin, or by any negligent, grossly negligent, strictly liable or intentional act of the CONTRACTOR, a subcontractor or any individual employee or laborer (whether or not an employee of the CONTRACTOR or a subcontractor) in the performance or supervision of actual trench excavation under the Contract. This indemnity applies regardless of whether OWNER'S or Engineer's negligence or fault in the administration of this Contract or in the preparation, review or approval of the OWNER'S or CONTRACTOR'S trench excavation plan contributed to the injury, death or damage. OWNER accepts no liability whatsoever as a result of its preparation, review or approval of any trench excavation plan under this Contract. OWNER makes no warranty, express or implied concerning the adequacy or correctness of any trench excavation plan.*

The provisions of this paragraph are solely for the benefit of the parties to the Contract and are not intended to create or grant any rights, contractual or otherwise, to any other person or entity. This paragraph shall not be construed to waive any governmental immunity of the OWNER. This paragraph controls in the event of a conflict with any other indemnity provision in the Contract Documents.

6.19.3.3 Trench Safety Plan. The CONTRACTOR shall be responsible for providing to the OWNER a trench safety plan signed and sealed by a Professional Engineer qualified to do such Work and licensed in the State of Texas. The CONTRACTOR shall be responsible for selecting an appropriate method of providing trench safety after due consideration of the job conditions, location of utilities, pavement conditions and other relevant factors. Slope-back methods which may result in unnecessary displacement of utilities and/or destruction of pavement shall not be used without permission from the OWNER.

6.19.3.4 Inspection. The CONTRACTOR shall cause all shoring or bracing to be inspected by an OSHA competent person. According to OSHA regulations, a competent person is defined as 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.

6.19.3.5 Payment for Trench Safety and Special Shoring. Payment for trench safety shall be by the linear feet (lf) of trench exceeding a depth of 5-ft. unless otherwise specified in the Contract. Excavation for slope-back methods shall be subsidiary to the trench safety pay item including replacement and recompaction. Excess excavation for other trench safety methods is also subsidiary to the trench safety pay item. Costs relating to the preparation of the trench safety plan including geotechnical investigation, testing and report preparation fees are all subsidiary to the pay item for trench safety. Should trench safety measures be required during Contract performance where no pay item has been provided, then the CONTRACTOR shall immediately notify the OWNER and, if directed to do so, provide trench safety under the provisions of “GC 3.2.3- Extra Work” and/or “GC 8.3-Payment for Extra Work.” Should the OWNER fail to authorize the Work as provided for in “GC 3.2.3-Extra Work” and “GC 8.3-Payment for Extra Work,” then the CONTRACTOR shall proceed under the provisions of “GC 3.3-Disputed Work and Claims for Additional Compensation” and “GC 3.4-Performance of Extra or Disputed Work.” Trench safety requirements are mandatory and shall not be waived.

6.20 PROJECT SIGNS

Project signs shall be furnished, constructed, and erected by the CONTRACTOR as directed by the OWNER and as defined in the Special Conditions. Signs shall be placed in a location selected by the OWNER and maintained in good condition until the completion of the project. Project signs shall be removed by the CONTRACTOR upon the completion and acceptance of the project by the OWNER.

6.21 WORKING AREA

The CONTRACTOR shall confine its equipment, storage of materials and construction operations to the area shown on the Contract drawings or stated in the specifications, prescribed by ordinance, laws, or permits or as may be directed by the OWNER, and shall not unreasonably encumber the site or public right-of-way with its construction equipment, plant or materials.

Such area shall not be deemed for the exclusive use of the CONTRACTOR. Other contractors of the OWNER may enter upon and use such portions of the area and for such items as determined by the OWNER are necessary for all purposes required by its contracts. The CONTRACTOR shall give to such other contractors all reasonable facilities and assistance to the end that the Work on this and other contracts shall not be unduly or unreasonably delayed. Any additional areas desired by the CONTRACTOR for its use shall be provided at its own effort, cost and expense.

All rights-of-way and easements shown on the plans for construction will be provided by the OWNER. If private property is leased or occupied by the CONTRACTOR for use in conjunction with the Work, the CONTRACTOR shall provide to the OWNER, in writing prior to final acceptance of the Work, a release of the CONTRACTOR and OWNER from any and all claims the private property owner has or may have as a result of the CONTRACTOR'S use of the private property during the course of the Work. The release shall be signed by the private property owner or the private property owner's agent.

6.22 RAILWAY CROSSINGS

Where the Work encroaches upon any right-of-way of any railway, the OWNER shall secure the necessary easement for the Work. Where railway tracks are to be crossed, the CONTRACTOR shall observe all the regulations and instructions of the railway company as to the permit requirements, methods of doing the Work or precautions for safety of property and the public. The railway company shall be notified by the CONTRACTOR not less than five (5) days prior to commencing the Work. The CONTRACTOR shall not be paid separate compensation for such railway crossing but shall receive only the compensation as set out in the bid form.

Prior to crossing or working on Railroad Right-of-Way, the CONTRACTOR will be required to contact the railroad company, or companies, and to execute CONTRACTOR'S Agreements as may be required by each railroad company involved. No Work shall be permitted where railroads are involved until the OWNER is furnished sufficient correspondence from the railroad company involved to ascertain that either the agreement has been executed and a certified copy of the insurance policy furnished, or that no such action is required.

6.23 EXISTING STRUCTURES, FACILITIES AND APPURTENANCES

6.23.1 General. This section addresses only matters arising from certain existing, man-made surface and subsurface structures, facilities and appurtenances, not naturally occurring conditions. *As provided in "GC 2.1 CONTRACTOR'S Warranties and Understanding," the OWNER shall have no liability whatsoever for any claim arising from a differing, naturally occurring surface or subsurface condition, or from any man-made condition that is not a surface or subsurface structure, facility or appurtenance.* The OWNER'S responsibility for any claim arising from existing, man-made surface and subsurface structures, facilities and appurtenances is governed solely by this section, and any situation involving a differing subsurface condition not included herein shall be governed solely by "GC 2.1-Contractor's Warranties and Understanding."

6.23.2 Showing Locations. The plans show the general locations of all known, existing man-made surface and subsurface structures, facilities and appurtenances. The locations of many gas mains, water and wastewater mains, storm sewers, drains, culverts, conduits and other man-made utility structures, facilities and appurtenances, however, are unknown. *The OWNER does not warrant the plans to show the exact locations of any and all known, existing man-made surface and subsurface structures, facilities and appurtenances, and does not warrant that it knows of the existence of all possible existing man-made surface and subsurface structures, facilities and appurtenances.* The OWNER assumes no responsibility, except as provided below, for any failure to show any or all of these structures on the plans or to show them in their exact locations.

Wherever the OWNER has caused certain test borings to be made on the site, or when any information pertaining to the character or depth of materials is found from observations, records or otherwise, such information revealed thereby may be indicated on the plans. The action of the OWNER in revealing such information shall not in any manner be construed as a warranty on the part of the OWNER of the exact nature of the subsurface conditions that shall be encountered during construction of the Work. Although the information is shown as accurately as possible, the OWNER does not guarantee that any materials to be encountered at any point or points are even approximately the same, either in character or elevations, as those shown on the plans. The information thus furnished by the OWNER is intended only as a guide to the CONTRACTOR'S own investigations preliminary to submitting a bid for the Work.

6.23.3 Conditions for Increases to Work or Payment. The CONTRACTOR and OWNER mutually, expressly agree that the failure of the OWNER to show any existing, man-made surface or subsurface structure, facility or appurtenance on the plans, or the failure to show them on the plans in their exact locations, shall not be considered as a basis of a claim for Extra Work, damages or other compensation of any kind, nor shall it be considered as a basis for increasing the quantities of Work or unit prices on any bid item, unless:

- (1) The CONTRACTOR could not have discovered the existing, man-made surface or subsurface structure, facility or appurtenance by a reasonable review of the plans and specifications and a reasonable, careful inspection of the Work site prior to bid opening or award of the Contract; and
- (2) The existing, man-made surface or subsurface structure, facility or appurtenance is in a location that necessitates a substantial change in the alignment, depth or hydraulic gradient of the Work to be constructed under the Contract because the CONTRACTOR cannot, by the use of reasonable skill or care, place the Work in accordance with the original alignment, depth or hydraulic gradient; or
- (3) The existing surface or subsurface structure, facility or appurtenance requires the construction of a special structure, facility, appurtenance or other special Work, provisions for which are not already made in the plans and specifications, to protect either the existing, man-made surface or subsurface structure, facility or appurtenance or the Work to be constructed under the Contract from damage.

If the elements of (1) and either (2) or (3) occur, the provisions of the specifications regarding claims for Extra Work apply. Otherwise, the condition is considered part of the Contract Work and OWNER shall not be liable for extra compensation. Provided, however, that the OWNER will not be liable for payment of Extra Work claims under this subsection that are not timely filed in accordance with other provisions of the specifications, nor shall the OWNER be liable to pay for any additional Work or additional costs arising solely from a decision of the CONTRACTOR to change the original means or methods of construction chosen because an existing, man-made surface or subsurface structure, facility or appurtenance is encountered.

6.23.4 Utility Coordination and Protection. It is the intention of the OWNER that all known conflicts between utility-owned facilities and the proposed construction will be cleared prior to the issuance of the Notice to Proceed. Utility information shown on the plans must be confirmed by actual field check in advance of construction.

It will be the CONTRACTOR'S responsibility to locate and report any and all utility conflicts to the OWNER promptly in order to avoid unnecessary delays, and the CONTRACTOR will cooperate with utility owners in making the adjustment(s). Conflicts that are found during construction will be resolved as expeditiously as possible.

The CONTRACTOR will be required to protect adequately all utility-owned facilities from damage or displacement by its operations.

The adjustment or location of any utility-owned facility which the CONTRACTOR may desire for its own convenience or ease of construction will be its responsibility to coordinate and will be at its own expense.

6.24 PROJECT CLEAN-UP

The CONTRACTOR shall be aware that keeping the project site in a neat and orderly condition is considered an integral part of the contracted Work and as such shall be considered subsidiary to the appropriate bid items. Clean up Work shall be done as directed by the OWNER as the Work progresses or as needed. If, in the opinion of the OWNER it is necessary, clean-up shall be done on a daily basis. Clean up Work shall include, but not be limited to:

- (1) Removing the trash, paper, rubbish and debris resulting from operations
- (2) Sweeping streets clean of dirt or debris
- (3) Alleviating any dust nuisance in the Work area
- (4) Storing excess material in appropriate and organized manner
- (5) Keeping trash of any kind off of residents' property.

If in the OWNER's opinion the jobsite has not been kept in an orderly condition, OWNER shall withhold future payments until cleanup is satisfactory.

Upon completion of the Work and before final acceptance and final payment shall be made, the CONTRACTOR shall completely clean and remove from the site of the Work all equipment, construction materials, surplus and discarded materials, temporary structures and debris of every kind. CONTRACTOR shall leave the site of the Work in a neat and orderly condition equal to that which originally existed, or as called for in the Contract Documents. Surplus and waste materials removed from the site of the Work shall be disposed of at locations satisfactory to the OWNER, and at the CONTRACTOR'S sole cost.

6.25 DISPOSAL OF MATERIALS

Surplus excavation and other materials removed as a part of the construction may be deposited at a legal disposal site in accordance with all applicable federal, state and local laws and regulations. In addition, if the materials are disposed of within private property, a release from the property owner must be obtained before final acceptance of the Work as described in "*GC 6.21-Working Area.*"

Surplus excavation and other materials must not be deposited in areas designated as flood plain or along natural drainage ways. Material so deposited will be required to be removed at the CONTRACTOR'S expense and the area restored to its natural condition.

Failure to comply promptly with the requirements of this provision will result in withholding of payments due.

6.26 RESTORATION OF PROPERTY

When and where any damage or injury is done to public or private property on the part of the CONTRACTOR, it shall restore or have restored at its own cost and expense such property to a condition equal (or improved) to that existing before such damage was done by repairing, rebuilding or otherwise restoring as may be directed, or it shall make good such damage or injury in a manner acceptable to the property owner or the OWNER. Replacement of previously constructed items, such as curb, gutter, sidewalks, driveways, paving, etc., shall conform to the specifications for new construction, unless directed otherwise by the OWNER.

In case of failure on the part of the CONTRACTOR to restore such property or make good such damage or injury, the OWNER may, upon 48 hours' written notice, under ordinary circumstances, and without

notice when a nuisance or hazardous condition results, proceed to repair, rebuild or otherwise restore such property as may be determined necessary, and the cost thereof shall be deducted from any monies due or to become due the CONTRACTOR under its Contract; or where sufficient Contract funds are unavailable for this purpose the CONTRACTOR or its surety shall reimburse the OWNER for all such costs.

GC 7 - PROSECUTION AND PROGRESS

7.1 PROGRESS SCHEDULE

The CONTRACTOR shall submit to the OWNER on the effective date of the Work order a written Progress Schedule showing the proposed dates of starting and completing each of the various sections of the Work, the anticipated monthly payments to become due to the CONTRACTOR, and the accumulated percent of progress each month. The Contract amount is deemed to be based upon a construction progress schedule requiring the full Contract time for completion. No claim for additional compensation shall be allowed as a result of the CONTRACTOR basing its bid on an early completion schedule, or as a result of delays and costs attributable to completion later than the planned early completion date. The progress schedule shall be updated upon request by the OWNER.

7.2 PROSECUTION OF THE WORK

The CONTRACTOR shall begin the Work to be performed under this Contract not later than ten (10) days from the date specified in the Work order and shall conduct the Work in such a manner and with sufficient equipment, material and labor as is necessary to insure its completion within the working time. It is the intent of this specification to provide a continuous construction operation without delay except as occasioned by unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, and it shall be the CONTRACTOR'S responsibility to execute the Work in the most expeditious manner.

Work shall be done only during the hours between 7am and 6pm unless the OWNER approves other hours. All Work shall be done in accordance with the requirements in the City Noise Ordinance.

CONTRACTOR may Work on Saturdays if it so desires and permission of the OWNER has been granted. Work on Sundays shall be permitted only with the written permission of the OWNER. If Saturday or Sunday Work is permitted, working time shall be charged on the same basis as weekdays. Where the working time is expressed as calendar days or a specific date, the concept of working days shall no longer be relevant to the Contract Work requiring inspection will not be permitted on a legal City holiday except by special written permission of the OWNER. Any Work done without proper inspection is subject to removal and replacement at the direction of the OWNER.

The rate of progress shall be such that the whole Work shall be performed and the premises cleaned up in accordance with the Contract within the working time established in the Contract, unless an extension of time is made in the manner as specified in "*GC 7.8.-Delays; Extension of Time; Liquidated Damages.*"

7.3 OTHER CONTRACTORS; OBLIGATION TO COOPERATE

The OWNER may award other contracts for additional Work on this project, and the CONTRACTOR shall fully cooperate with such other contractors and shall coordinate and fit its Work to be done hereunder to such additional Work as may be contracted by the OWNER. At the time of bidding, prospective bidders shall be advised of other planned Contract Work, which is expected to affect the Work area. The CONTRACTOR shall not commit or permit any act, which shall interfere with the performance of Work by any other contractor.

Upon receiving written notice from the CONTRACTOR that another contractor is failing to coordinate its Work with the Work under this Contract as directed by the OWNER, the OWNER shall promptly investigate the charge and take such necessary action as the situation may require. However, the OWNER shall not be liable to the CONTRACTOR for damages suffered by the CONTRACTOR due to

the fault or negligence of another contractor or through failure of another contractor to carry out the directions of the OWNER. Should any interference occur between contractors, the OWNER may furnish the CONTRACTOR with written instructions designating priority of effort or change in methods, whereupon the CONTRACTOR shall immediately comply with such direction. In such event, the CONTRACTOR shall be entitled to an extension of working time only for unavoidable delays verified by the OWNER; however, no increase in the Contract price shall be due the CONTRACTOR.

7.4 EMPLOYEES

The CONTRACTOR shall employ only competent, efficient workers and shall not use on the Work any unfit person or one not skilled in the Work assigned to him or her and shall at all times maintain good order among its employees.

Whenever the OWNER shall inform the CONTRACTOR in writing that, in its opinion, any employee is unfit, unskilled, disobedient or is disrupting the orderly progress of the Work, such employee shall be removed from the Work and shall not again be employed on it.

Under urgent circumstances, the OWNER may orally require immediate removal of an employee for cause, to be followed by written confirmation.

7.5 SUBCONTRACTS

The CONTRACTOR shall not make any subcontract for performing any portion of the Work included in the Contract without written notice to the OWNER. This Contract having been made pursuant to the bid submitted by the CONTRACTOR and in reliance with the CONTRACTOR'S personal qualifications and responsibility, the OWNER reserves the right to withhold approval of any subcontractor that OWNER may deem would not be in the OWNER'S best interest.

The CONTRACTOR shall, as soon as practicable after signing the Contract, submit a separate written notice to the OWNER identifying each proposed subcontractor. Upon request of the OWNER, the CONTRACTOR shall promptly furnish additional information tending to establish that any proposed subcontractor has the necessary facilities, skill, integrity, past experience and financial resources to perform the Work in accordance with the terms and conditions of this Contract.

If the OWNER determines that any proposed subcontractor is unacceptable, it shall so notify the CONTRACTOR, who may thereupon submit another proposed subcontractor unless the CONTRACTOR decides to do the Work itself. Disapproval by the OWNER of any proposed subcontractor shall not provide a basis for any time extension claim or additional compensation of any nature, including but not limited to anticipated profit, overhead or delay, by the CONTRACTOR.

If an approved subcontractor fails to properly perform the Work undertaken, it shall be removed from the job upon request of the OWNER, following notification to the CONTRACTOR in writing of the request for removal and the reasons therefore.

Each subcontract entered into shall provide that the provisions of this Contract shall apply to all subcontractors and their officers and employees in all respects as if they were employees of the CONTRACTOR. The OWNER'S decision not to disapprove of any subcontract shall not relieve the CONTRACTOR of any of its responsibilities, duties and liabilities hereunder. The CONTRACTOR shall be solely responsible for the acts, omissions, negligence or defaults of its subcontractors and of such subcontractor's officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the CONTRACTOR to the extent of its subcontract.

The CONTRACTOR agrees to bind each subcontractor and each subcontractor agrees to be bound by the terms of the Contract Documents insofar as applicable to its respective Work. The CONTRACTOR and each subcontractor jointly and severally agree that nothing in the Contract Documents or otherwise shall create or be deemed to create any rights in favor of a subcontractor against the OWNER; nor shall be deemed or construed to impose upon the OWNER any obligation, liability or duty to a subcontractor; or to create any contractual relation whatsoever between a subcontractor and the OWNER.

The provisions contained herein shall likewise apply to any sub-subcontracts.

7.6 ASSIGNMENTS

The CONTRACTOR shall not assign, transfer, convey or otherwise dispose of this Contract, or its right to execute it, or its right, title or interest in it or any part thereof without the previous written consent of the surety company and the written approval of the OWNER.

The CONTRACTOR shall not assign, either legally or equitably, by power of attorney or otherwise, any of the monies due or to become due under this Contract or its claim thereto without the prior written consent of the surety company and the written approval of the OWNER. Nothing in this paragraph is intended to conflict with Texas Business and Commerce Code.

The approval of the OWNER of a particular assignment, transfer or conveyance shall not dispense with such approval to any further or other assignments.

The approval by the OWNER of any assignment, transfer or conveyance shall not operate to release the CONTRACTOR or surety hereunder from any of the Contract and bond obligations, and the CONTRACTOR shall be and remain fully responsible and liable for the defaults, negligent acts and omissions of its assignees, its agents and employees, as if they were its own.

7.7 OWNER'S RIGHT TO TEMPORARILY SUSPEND WORK

7.7.1 Reasons for Suspension. The OWNER shall have the right by written order to temporarily suspend the Work, in whole or in part, whenever, in the judgment of the OWNER, such temporary suspension is required:

- (1) in the interest of the OWNER generally,
- (2) due to government or judicial controls or orders which make performance of this Contract temporarily impossible or illegal,
- (3) to coordinate the Work of separate contractors at the job site,
- (4) to expedite the completion of a separate contract even though the completion of this particular Contract may be thereby delayed,
- (5) because of weather conditions unsuitable for performance of the Work, or
- (6) because the CONTRACTOR is proceeding contrary to Contract provisions or has failed to correct conditions considered unsafe for workers.

The written order of the OWNER to the CONTRACTOR shall state the anticipated period for such suspension. Upon receipt of the OWNER'S written order, the CONTRACTOR shall suspend the Work covered by the order and shall take such means and precautions as may be necessary to properly protect the finished and partially finished Work, the unused materials and uninstalled equipment, including the providing of suitable drainage about the Work and erection of temporary structures where necessary. The CONTRACTOR shall not suspend the Work without written order from the OWNER and shall proceed with the Work promptly when notified by the OWNER to resume operations.

7.7.2 No Additional Compensation. No additional compensation shall be paid to the CONTRACTOR for any suspension under “GC 7.7.1-Reasons for Suspension” above or otherwise where same is caused by the fault of the CONTRACTOR. Where such temporary suspension is not due to the fault of the CONTRACTOR, it shall be entitled to:

- (1) an equitable extension of working time for the completion of the Work, not to exceed the delay caused by such temporary suspension, as determined by the OWNER; and
- (2) the actual and necessary costs of properly protecting the finished and partially finished Work, unused materials and uninstalled equipment during the period of the ordered suspension as determined by the OWNER as being beyond the Contract requirements, such costs, if any, to be determined on the basis set forth in “GC 8.3-Payment for Extra Work,” herein; and
- (3) where the CONTRACTOR elects to move equipment from the job site and then return it to the site when the Work is ordered resumed, the actual and necessary costs of these moves, in an amount determined by the OWNER under the provisions of “GC 8.3 Payment for Extra Work” provided; however, no compensation shall be allowed if the equipment is moved to another construction project for the OWNER.

Other than the additional time and compensation stated above, CONTRACTOR shall not be entitled to any other time extension related to the suspension, nor any additional compensation in any way related to such suspension.

7.7.3 Emergency Contract Termination Clause. Whenever, because of a national emergency, so declared by the President of the United States, or other lawful authority, it shall be impossible for the CONTRACTOR to obtain all labor, materials, and equipment necessary for the prosecution of the Work with reasonable continuity, the CONTRACTOR shall notify the OWNER. If the OWNER cannot, after a reasonable time, help obtain priorities for the materials and equipment within a reasonable effort, then the Contract shall be considered as terminated, and the CONTRACTOR shall be entitled to payment for Work performed that is acceptable to OWNER based upon unit prices contained in the bid or, if the Contract is lump sum, then based upon the schedule of values submitted by the CONTRACTOR. CONTRACTOR shall not be entitled to any compensation for anticipated profit, overhead, delay damages or any other compensation for Work that has not been performed.

7.8 DELAYS; EXTENSION OF TIME; LIQUIDATED DAMAGES

The CONTRACTOR shall be entitled to an extension of working time under this Contract only when claim for such extension is submitted to the OWNER in writing by the CONTRACTOR within fourteen (14) days from and after the time when any alleged cause of delay shall occur, and then only when such time is approved by the OWNER. In adjusting the Contract working time for the completion of the project, unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to inability to obtain supplies and materials when orders for such supplies and materials were timely made, acts of God, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather conditions or delays of subcontractors due to such causes beyond their control shall be taken into consideration.

If the satisfactory execution and completion of the Contract should require Work and materials in greater amounts or quantities than those set forth in the Contract, requiring more time for completion than the anticipated time, then the Contract working time shall be equitably increased, but not more than in the same proportion as the cost of the additional Work bears to the cost of the original Work contracted for. No allowances shall be made for delays or suspension of the performance of the Work due to the fault of the CONTRACTOR.

No adjustment of the Contract working time shall be made if, concurrently with the equitable cause for delay, hindrance, disruption, force majeure, impact or interference, there existed a cause for delay due to the fault or negligence of the CONTRACTOR or CONTRACTOR'S agents, employees or subcontractors. Notwithstanding any other provisions of the Contract Documents, including the General and Special Conditions, no adjustment shall be made to the Contract price and the CONTRACTOR shall not be entitled to claim or receive any additional compensation as a result of or arising out of any delay, hindrance, disruption, force majeure, impact or interference, foreseen or unforeseen, resulting in adjustment of the Contract working time, ***including but not limited to those caused in whole or in part by the act, omissions, failures, negligence or fault of the Engineer, OWNER, its officers, servants or employees.*** Notwithstanding any other provision of the Contract Documents, all claims for extension of working time must be submitted in accordance with “GC 7.8-Delays; Extension of Time; Liquidated Damages,” and no act of the OWNER shall be deemed a waiver or entitlement of such extension.

7.8.1 Liquidated Damages for Failure to Complete On Time. The time of completion is the essence of this Contract. For each day that any Work shall remain uncompleted after the time specified in the Bid Form and the Contract, or the increased time granted by the OWNER, or as equitably increased by additional Work or materials ordered after the Contract is signed, the sum per day given in “SC 10 - Liquidated Damages”, shall be deducted from the monies due the CONTRACTOR.

The sum of money thus deducted for such delay, failure or noncompletion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, per day that the CONTRACTOR shall be in default after the time stipulated in the Contract for completing the Work. The said amounts are fixed and agreed upon by and between OWNER and CONTRACTOR because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER in such event would sustain; and said amounts are agreed to be the amount of damages that the OWNER would sustain and that shall be retained from the monies due, or that may become due, the CONTRACTOR under this Contract; and if said monies be insufficient to cover the amount Owing, then the CONTRACTOR or its surety shall pay any additional amounts due.

In the event that the actual damages incurred by the OWNER exceed the amount of liquidated damages, OWNER shall be entitled to recover its actual damages.

7.9 CONTRACTOR DEFAULT: OWNER’S RIGHT TO SUSPEND WORK AND TERMINATE CONTRACT

The Work or any portion of the Work under this Contract shall be suspended immediately on written order of the OWNER declaring the CONTRACTOR to be in default. A copy of such notice shall be served on the CONTRACTOR'S surety. The Contract may be terminated by the OWNER for any cause or causes, among others of which special reference is made to the following:

- (1) failure of the CONTRACTOR to start the Work within 10 days from date specified in the written Notice to Proceed issued by the OWNER to begin the Work;
- (2) substantial evidence that the progress of the Work being made by the CONTRACTOR is insufficient to complete the Work within the specified working time;
- (3) failure of the CONTRACTOR to provide sufficient and proper equipment, materials or construction forces for properly executing the Work;
- (4) substantial evidence that the CONTRACTOR has abandoned the Work or discontinued the performance of the Work or any part thereof and failure to resume performance within a reasonable time after notice to do so;

- (5) substantial evidence that the CONTRACTOR has become insolvent or bankrupt, or otherwise financially unable to carry on the Work;
- (6) deliberate failure on the part of the CONTRACTOR to observe any requirements of the Contract Documents or to comply with any orders given by the OWNER or Engineer as provided for in the Contract Documents;
- (7) failure of the CONTRACTOR to promptly make good any defects in materials or workmanship, or any defects of any nature, the correction of which has been directed in writing by the OWNER;
- (8) substantial evidence of collusion for the purpose of illegally procuring a contract or perpetrating fraud on the OWNER in the construction of Work under Contract;
- (9) repeated and flagrant violations of safe working procedures;
- (10) the filing by the CONTRACTOR of litigation against the OWNER prior to final completion of the Work.

When the Work is suspended for any of the causes itemized above, or for any other cause or causes, the CONTRACTOR shall discontinue the Work or such part thereof as the OWNER shall designate, whereupon the surety may either at its option assume the Contract or that portion thereof which the OWNER has ordered the CONTRACTOR to discontinue and perform the same or, with the written consent of the OWNER, sublet the same, provided; however, that the surety shall exercise its option within two (2) weeks after the written notice to discontinue the Work has been served upon the CONTRACTOR and upon the surety or its authorized agents. The surety in such event shall assume the CONTRACTOR'S place in all respects and shall be paid by the OWNER for all Work performed by it in accordance with the terms of the Contract, but in no event shall such payments exceed the Contract amount, regardless of the cost to the surety to complete the Work.

All monies remaining due the CONTRACTOR at the time of its default shall thereupon become due and payable to the surety as the Work progresses, subject to all terms of the Contract. In case the surety does not, within the hereinabove specified time, exercise its obligation to assume the Contract or that portion thereof which the OWNER has ordered the CONTRACTOR to discontinue, then the OWNER shall have the power to complete by contract or otherwise, as it may determine, the Work herein described or such part thereof as it may deem necessary; and the CONTRACTOR hereto agrees that the OWNER shall have the right to take possession of or use any or all of the materials, tools, equipment, supplies and property of every kind provided by the CONTRACTOR for the purpose of its Work and to procure other tools, equipment and materials for the completion of the same and to charge to the account of the CONTRACTOR the expense of said Contract for labor, materials, tools, equipment and expenses incident thereto. The expense so charged shall be deducted by the OWNER out of such monies as may be due or may at any time thereafter become due the CONTRACTOR under and by virtue of the Contract or any part thereof.

The OWNER shall not be required to obtain the lowest bid for the Work of completing the Contract, but the expenses to be deducted shall be the actual cost of such Work. In case such expense is less than the sum which would have been payable under the Contract if the same had been completed by the CONTRACTOR, then in such case the OWNER may pay the CONTRACTOR the difference in the cost, provided that the CONTRACTOR shall not be entitled to any claim for damages or for loss of anticipated profits.

In case such expense shall exceed the amount which would have been payable under the Contract if the same had been completed by the CONTRACTOR, the CONTRACTOR and its surety shall pay the amount of the excess to the OWNER on notice from the OWNER for excess due including any costs incurred by the OWNER, such as inspection, legal fees and liquidated damages. When any particular part of the Work is being carried on by the OWNER by contract or otherwise under the provisions of this section, the CONTRACTOR shall continue the remainder of the Work in conformity with the terms of the Contract and in such manner as not to hinder or interfere with the performance of workers employed as above provided by the OWNER or surety.

7.10 SUSPENSION BY COURT ORDER AGAINST THE OWNER

The CONTRACTOR shall suspend such part or parts of the Work pursuant to a court order issued against the OWNER and shall not be entitled to additional compensation for anticipated profits, overhead, delay damage or any other form of compensation by virtue of such court order; neither shall the CONTRACTOR be liable to the OWNER in the event the Work is suspended by such court order, unless such suspension is due to the fault or negligence of the CONTRACTOR.

7.11 TERMINATION FOR CONVENIENCE OF THE OWNER

7.11.1 Notice of Termination. The performance of the Work under this Contract may be terminated by the OWNER in whole or from time to time in part, in accordance with this section, whenever the OWNER shall determine that such termination is in the best interest of the OWNER. Any such termination shall be effected by serving in accordance with “GC 4.8-Service of Notices” a notice of termination to the CONTRACTOR specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective. Further, it shall be deemed conclusively presumed and established that such termination is made with just cause as therein stated; and no proof in any claim, demand or suit shall be required of the OWNER regarding such discretionary action.

7.11.2 Contractor Action. After receipt of a notice of termination, and except as otherwise directed by the Engineer, the CONTRACTOR shall:

- (1) stop Work under the Contract on the date and to the extent specified in the notice of termination;
- (2) place no further orders or subcontracts for materials, services or facilities except as may be necessary for completion of such portion the Work under the Contract as is not terminated;
- (3) terminate all subcontracts, purchase orders or options to the extent that they relate to the performance of Work terminated by the notice of termination or at the OWNER'S written request, deliver and assign to the OWNER, or any person or entity acting on the OWNER'S behalf, any or all subcontracts, purchase orders and options made by CONTRACTOR in the performance of the Work, and deliver to the OWNER true and correct originals and copies of such Contract Documents;
- (4) transfer title to the OWNER and deliver in the manner, at the times, and to the extent, if any, directed by the OWNER:
 - a. the fabricated or unfabricated parts, Work in process, completed Work, supplies and other material produced as a part of, or acquired in connection with the performance of, the Work terminated by the notice of termination; and
 - b. the completed or partially completed plans, drawings, information and other property which,

if the Contract had been completed, would have been required to be furnished to the OWNER.

- (5) complete performance of such part of the Work as shall not have been terminated by the notice of termination; and
- (6) take such action as may be necessary, or as the OWNER may direct, for the protection and preservation of the property related to its Contract which is in the possession of the CONTRACTOR and in which the OWNER has or may acquire an interest.

At a time not later than 30 days after the termination date specified in the notice of termination, the CONTRACTOR may submit to the OWNER—a list, certified as to the quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the OWNER. Not later than 15 days thereafter, the OWNER shall accept title to such items and remove them or enter into a storage agreement covering the same, provided that the list submitted shall be subject to verification by the OWNER upon removal of the items, or, if the items are stored, within 45 days from the date of submission of the list, and provided that any necessary adjustments to correct the list as submitted shall be made prior to final settlement.

7.11.3 Termination Claim. Within 60 days after notice of termination, the CONTRACTOR shall submit its termination claim to the OWNER in the form and with the certification prescribed by the OWNER. Unless one or more extensions in writing are granted by the OWNER upon request of the CONTRACTOR, made in writing within such 60-day period or authorized extension thereof, any and all such claims shall be conclusively deemed waived.

7.11.4 Amounts. Subject to the provisions of “*GC 7.11.3-Termination Claim,*” the CONTRACTOR and OWNER may agree upon the whole or any part of the amount or amounts to be paid to the CONTRACTOR by reason of the total or partial termination of Work pursuant hereto, provided that such agreed amount or amounts shall never exceed the total Contract price as reduced by the amount of payments otherwise made and as further reduced by the Contract price of Work not terminated. The Contract shall be amended accordingly, and the CONTRACTOR shall be paid the agreed amount. No amount shall be due for lost or anticipated profits. Nothing in “*GC 7.11.5-Failure to Agree*” hereunder, prescribing the amount to be paid to the CONTRACTOR in the event of failure of the CONTRACTOR and the OWNER to agree upon the whole amount to be paid to the CONTRACTOR by reason of the termination of Work pursuant to this section, shall be deemed to limit, restrict or otherwise determine or affect the amount or amounts that may be agreed upon to be paid to the CONTRACTOR pursuant to this paragraph.

7.11.5 Failure to Agree. In the event of the failure of the CONTRACTOR and the OWNER to agree, as provided in “*GC 7.11.4-Amounts,*” upon the whole amount to be paid to the CONTRACTOR by reason of the termination of Work pursuant to this section, the OWNER shall determine, on the basis of information available to it, the amount, if any, due to the CONTRACTOR by reason of the termination and shall pay to the CONTRACTOR the amounts determined. No amount shall be due for lost or anticipated profits.

7.11.6 Deductions. In arriving at the amount due the CONTRACTOR under this section, there shall be deducted (a) all unliquidated advance or other payments on account theretofore made to the CONTRACTOR, applicable to the terminated portion of this Contract; (b) any claim which the OWNER may have against the CONTRACTOR in connection with this Contract; and (c) the agreed price for or the proceeds of sale of any materials, supplies or other things kept by the CONTRACTOR or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the OWNER.

7.11.7 Adjustment. If the termination hereunder be partial prior to the settlement of the terminated portion of this Contract, the CONTRACTOR may file with the OWNER a request in writing for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the notice of termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices; nothing contained herein, however, shall limit the right of the OWNER and the CONTRACTOR to agree upon the amount or amounts to be paid to the CONTRACTOR for the completion of the continued portion of the Contract when said Contract does not contain an established Contract price for such continued portion.

7.11.8 No Limitation of Rights. Nothing contained in this section shall limit or alter the rights, which the OWNER may have for termination of this Contract under “GC 7.9-CONTRACTOR Default: OWNER'S Right to Suspend Work and Annual Contract” or any other right that OWNER may have for default or breach of Contract by CONTRACTOR.

7.12 CLAIMS AGAINST OWNER AND ACTION THEREON

No claim against the OWNER under the Contract or for breach of the Contract or additional compensation for extra or disputed Work shall be made or asserted against the OWNER under the Contract or in any court action except pursuant to the provisions of “GC 8.3-Payment for Extra Work,” “GC 3.3-Disputed Work and Claims for Additional Compensation,” and “GC 3.3-Performance of Extra or Disputed Work,” and unless the CONTRACTOR shall have strictly complied with all requirements relating to the giving of notice and information with respect to such claim as required under said sections.

7.13 USE OF COMPLETED PORTIONS OF WORK

The OWNER may, after written notice to the CONTRACTOR, and without incurring any liability for increased compensation to the CONTRACTOR, take over and use any completed portion of the Work prior to the final completion and acceptance of the entire Work included in the Contract, and notwithstanding that the time allowed for final completion has not expired. The CONTRACTOR shall not object to, nor interfere in any way with, such occupancy or use after receipt of the OWNER'S written notice.

Immediately prior to such occupancy and use, the OWNER shall inspect such portion of the Work to be taken over and shall furnish the CONTRACTOR a written statement of the Work, if any, still to be done on such part. The CONTRACTOR shall promptly thereafter complete such unfinished Work to permit occupancy and use on the date specified in the OWNER'S written order, unless the OWNER shall permit specific items of Work to be finished after the occupancy and use by the OWNER.

The provisions in the last two paragraphs above shall not apply to portions of roads, streets, bridges or detours upon which traffic is diverted to enable the continuation of the Contract Work.

Neither such usage, as performed under this section, nor the written statement of Work still to be done shall be held in any way an acceptance of said Work or structure or any part thereof, nor as a waiver of any of the provisions of these specifications or other Contract Documents pending final completion and acceptance of the Work; all necessary repairs and removals of any section of the Work so put into use, due to the defective materials or workmanship or to operations of the CONTRACTOR, shall be performed by the CONTRACTOR at its own expense.

In the event the CONTRACTOR is unreasonably delayed by the OWNER exercising its rights under this section, the CONTRACTOR may submit a request for an extension of time under “GC 7.8-Delays; Extension of Time; Liquidated Damages”; no additional compensation or delay damages will be paid.

GC 8 - MEASUREMENT AND PAYMENT

8.1 PAYMENT FOR LABOR AND MATERIAL; NO LIENS

The CONTRACTOR shall furnish payrolls and personnel records, which pertain to current construction contracts with the OWNER for the purpose of ascertaining compliance with minimum wage rates published by the OWNER and as included in the Special Conditions. Monthly and final estimates for payment will not be processed unless the CONTRACTOR complies with this requirement in a timely manner.

The CONTRACTOR for itself or any of its subcontractors shall pay all indebtedness, which may become due to any person, firm or corporation having furnished labor, material or both in the performance of this Contract. It shall be the responsibility of each person, firm or corporation claiming to have furnished labor, materials or both, in connection with this Contract, to protect its interest in the manner prescribed by applicable laws of the State of Texas, provided; however, that as this Contract provides for a public works project, no lien of any kind shall ever exist or be placed against the Work or any portion thereof, or any public funds or retainage held by the OWNER; and any subcontractor shall look solely to the CONTRACTOR and the payment bond surety, and not the OWNER, for payment of any outstanding amounts due for labor, materials or any other indebtedness in connection with the Work. However, the OWNER may, at any time prior to making final payment, require the CONTRACTOR to furnish a Consent of Surety to any payment due the CONTRACTOR for completed Work and may, at the discretion of the OWNER or the request of the Surety, make the check jointly payable to the CONTRACTOR and the Surety.

8.2 PAYMENT FOR MATERIALS

8.2.1 Materials On-Hand. Materials purchased and stored more than 30 days before use shall be considered materials on-hand. Payment for such materials shall be made as materials are consumed, according to “GC 8.5-Monthly Estimate, Partial Payments, Retainage, Final Inspection, Acceptance and Final Payment.”

8.2.2 Materials Stored Off-Site. Off-site storage of such materials and payment for off-site storage shall be accomplished according to “GC 5.4-Off-Site Storage.”

8.3 PAYMENT FOR EXTRA WORK

8.3.1 General. Extra Work done by the CONTRACTOR, as authorized and approved by the OWNER, shall be compensated for in the manner described in this “GC 8.3-Payment for Extra Work.” The compensation provided for Extra Work done constitutes full and final payment for the cost of the Extra Work, which cost is limited to: (1) all reasonable costs of labor, materials, supplies, tools, equipment or machinery rental, power, fuel, lubricants, water and other similar operation expenses (but only for the time that such of the above things are employed or used on such Extra Work) incurred in the performance of the Extra Work, and a ratable proportion of premium expenses for all bonds and insurance required under the Contract, to the extent that the Extra Work would cause an increase in such bond or insurance premiums; and (2) a markup amount of not-to-exceed 15-percent of the above mentioned costs to cover and compensate the CONTRACTOR or any subcontractor or supplier for profit (subcontractor or supplier cannot markup more than 15-percent), overhead, profit-and-overhead markups charged to CONTRACTOR by other subcontractors and suppliers, general supervision, field office expense and all other elements of cost and expense not embraced within the cost of the Extra Work as described in this section. No cost of off-site storage shall be included in the above description of cost unless off-site storage has been approved and directed by the OWNER in writing. No other claims or reservations of

right as to additional costs, prices, markups, costs not permitted to be included under this paragraph, disallowed costs or other future additional money or time shall be accepted; each change order shall be specific and final as described in “GC 3.2.4-Finality of Change Orders.”

8.3.2 Method of Determination. The method of determination and payment of cost, or credit to the OWNER, for any Extra Work shall be one of the following:

- (1) Unit prices agreed on in writing by the OWNER and executed by the OWNER and CONTRACTOR before the Extra Work is commenced, or unit prices already included in the Contract Documents, subject to all other conditions of the Contract. Mutual acceptance of a not-to-exceed lump sum properly itemized and supported by sufficient substantiating data to permit evaluation before the Extra Work is commenced, subject to all other conditions of the Contract.
- (2) A not-to-exceed cost to be determined in a manner agreed upon by the parties plus a mutually acceptable fixed or percentage fee, agreed upon before the Extra Work is commenced and subject to all other conditions of the Contract.
- (3) The force account method provided in “GC 8.3.3-Force Account Work.”

8.3.3 Force Account Work. If the CONTRACTOR and the OWNER cannot agree to one of the methods of calculating cost provided in “GC 8.3.2-Method of Determination” above, or if the parties agree to a method but cannot agree to a final dollar figure, or if the CONTRACTOR for whatever reason fails or refuses to sign the Change Order in question, the CONTRACTOR, provided it receives a written order signed by the OWNER, shall promptly proceed with the Work involved. Nothing in this paragraph shall be construed to relieve the CONTRACTOR of any obligations it has under the disputed Work provisions of “GC 3.3-Disputed Work and Claims for Additional Compensation,” and “GC 3.4-Performance of Extra or Disputed Work,” and where applicable the CONTRACTOR is still obligated to abide with those conditions as well as this “GC 8.3.3 Force Account Work.” The cost of the Work involved shall then be calculated on a force account basis, on the basis of the actual, reasonable field cost of the Work attributable to the changes, plus a reasonable allowance for overhead, profit, markups of other subcontractors and suppliers, general supervision, field office expense and other elements of cost not embraced within the actual field cost as specified herein, such allowance in any case never to exceed 15%. In such case, the CONTRACTOR shall keep a detailed itemized account of the Work involved and the actual field cost incurred, in a format acceptable to the Engineer and the OWNER and with such appropriate supporting data as the Engineer and the OWNER may prescribe. Sworn copies of the itemized accounting shall be directed to the OWNER each day during the performance of the force account Work. Failure of the CONTRACTOR to submit the sworn-to itemized accounting daily as required herein shall constitute a waiver by the CONTRACTOR of any right to dispute the OWNER'S determination of the amount due the CONTRACTOR for force account Work.

Actual, reasonable field cost of the Work to be charged under this “GC 8.3.3-Force Account Work” for force account Work is limited to the following:

- (1) The reasonable wages of all workers, foremen, timekeepers, mechanics and laborers, plus costs of social security, old age and unemployment insurance, fringe benefits required by agreement or custom (excluding employee or executive bonuses), and worker's compensation insurance, for the time such labor is actually employed or used on force account Work.
- (2) Reasonable costs of materials, tools, supplies and equipment (but not to include off-site storage unless so approved and directed in writing by the OWNER), whether incorporated or consumed into the force account Work.

- (3) Reasonable rental costs of machinery and equipment as determined by the OWNER using standard equipment rental rates, exclusive of hand tools, only for the time actually employed or used on force account Work, whether rented from the CONTRACTOR or others.
- (4) A pro rata portion of premium expenses for all bonds and insurance to the extent force account Work would cause an increase in such bond or insurance premiums.

Pending final determination of the cost to the OWNER, payment of undisputed amounts on force account shall be included on the monthly estimate as Work is completed unless otherwise expressly provided in the written order signed by the OWNER to perform the Work. Nothing in this section shall be construed as directing the CONTRACTOR'S means and methods of performing the Work in question.

8.3.4 Distinguishing Extra Work. For purposes of this Item or any other provision of the Contract Documents that allows a claim for Extra Work, the term "Extra Work" means Work that is not reasonably within the scope of the Contract Documents and not otherwise incidental or necessary to performance of the Contract. The term does not include any change by the CONTRACTOR in the means and methods of performing the Work from that anticipated or bid (even if such change in means or methods is requested or directed by the OWNER), whether or not the change is due to foreseeable or unforeseeable events or conditions, if the intended result or scope of the Work is not expanded or increased. The OWNER shall not be liable for any claim due to a change in the means or methods of construction by the CONTRACTOR, resulting in additional costs, if the OWNER has not changed the plans or specifications and if the intended result and scope of the Work required by and reasonably inferred from the Contract Documents remains the same. The OWNER shall also not be liable for any claim for Work required in performance of the Contract, without which the Contract could not be completed, notwithstanding that the CONTRACTOR did not contemplate or foresee the degree or amount of Work that would be necessary or required to complete the Contract and notwithstanding that it cost the CONTRACTOR more to complete the Contract Work than the original Contract price.

8.4 PAYMENT WITHHELD

In addition to express provisions elsewhere contained in the Contract, the OWNER may withhold from any payment otherwise due the CONTRACTOR such amount as determined necessary to protect the OWNER'S interest, or, if it so elects, may withhold or retain all or a portion of any payment or refund payment on account of:

- (1) unsatisfactory progress of the Work not caused by conditions beyond the CONTRACTOR'S control,
- (2) defective Work not corrected,
- (3) CONTRACTOR'S failure to carry out instructions or orders of the OWNER or its representative,
- (4) a reasonable doubt that the Contract can be completed for the balance then unpaid,
- (5) Work or execution thereof not in accordance with the Contract Documents,
- (6) claim filed by or against the CONTRACTOR or reasonable evidence indicating probable filing of claims,
- (7) failure of the CONTRACTOR to make payments to any subcontractor or suppliers for material or labor used in the performance of the Work,

- (8) damage to another CONTRACTOR,
- (9) unsafe working conditions allowed to persist by the CONTRACTOR,
- (10) failure of the CONTRACTOR to provide Work schedules as required by the OWNER,
- (11) use of subcontractors without the OWNER's approval or
- (12) failure of the CONTRACTOR to keep current record drawings at the job site or to turn same over in completed form to the OWNER.
- (13) failure of the CONTRACTOR to comply with the requirements of "GC 6.24 - Project Clean-up and SC 8 – Clean-up." SC-8 is a project specific requirement.

When the grounds for withholding payment are removed, payment shall be made for amounts withheld because of them, and OWNER shall never be liable for interest on any delayed or late payment.

8.5 INTERIM PAYMENT APPLICATION, PARTIAL PAYMENTS, RETAINAGE, FINAL INSPECTION, ACCEPTANCE AND FINAL PAYMENT

8.5.1 Interim Payment Application. Except as otherwise provided by the Contract, between the 25th day and the last day of each month the CONTRACTOR shall make an estimate of the value of the Work done during the month under the Contract Documents. The CONTRACTOR shall prepare the payment application on a form approved by the OWNER. The CONTRACTOR shall forward the payment application required above to the OWNER by not later than the last day of the month. The payment application may include acceptable nonperishable materials delivered to and stored at the Work site or a storage facility accessible to the OWNER; payment for such stored materials shall be allowed on the same percentage basis of the value as provided hereinafter. The payment application shall also provide such supporting documentation as the OWNER and Engineer or the other applicable provisions of the specifications may require. The OWNER may verify that the CONTRACTOR'S payment application matches the total value of Work done and acceptable non-perishable materials delivered to the Work site or storage facility, based upon the bid proposal prices and quantities measured or verified by OWNER. In the event of a discrepancy between quantities of Work as shown in the CONTRACTOR'S payment application and measured quantities as shown in the OWNER'S verification, the OWNER'S determination or measurement shall be final, and the CONTRACTOR'S payment application shall be adjusted to reflect the quantities of Work as shown by the OWNER'S verification. Payment shall be made by OWNER about thirty (30) days after OWNER'S acceptance of the payment application from CONTRACTOR. OWNER shall not be liable for interest on any late or delayed payment caused by any claim or dispute, any discrepancy in quantities as described above, any failure to provide supporting documentation or other information required with the payment application or as a precondition to payment under the Contract, or due to any payment the OWNER has a right to withhold under the Contract.

The CONTRACTOR shall submit to the OWNER a Schedule of Values for each Lump Sum item of Work for review and approval 20 days before the Work is scheduled to be performed. The CONTRACTOR shall itemize in the Schedule of Values the actual costs to the CONTRACTOR to perform the various parts of the Lump Sum item Work which shall include a reasonable overhead and profit cost item. Partial payment for Lump Sum items shall be made based on the value and percentage of the Work in the bid item completed, as approved by the OWNER and as reflected in the Schedule of Values.

The CONTRACTOR shall furnish to the OWNER such detailed information as OWNER may request to assist in the preparation of monthly estimates. It is understood that the monthly estimates shall be approximate only, and all monthly estimates and partial payments shall be subject to correction in the estimate rendered following the discovery of an error in any previous estimate, and such estimate shall not in any respect be taken as an admission of the OWNER of the amount of Work done or of its quality or sufficiency nor as an acceptance of the Work or the release of the CONTRACTOR of any of its responsibility under the Contract.

8.5.2 Retainage. As security for the faithful completion of the Work by the CONTRACTOR, the OWNER shall retain 10-percent of the total dollar amount of Work done on all contracts \$50,000.00 and less and 5-percent of the total dollar amount of Work done on all contracts in excess of \$50,000.00.

8.5.3 Final Inspection and Acceptance. Final inspections and acceptance shall proceed according to “GC 4.9-Inspection” and “GC 4.10-Final Acceptance.”

8.5.4 Final Payment. Whenever the improvements provided for by the Contract shall have been completely performed on the part of the CONTRACTOR, as evidenced in the certificate of acceptance obtained according to “GC 4.10-Acceptance,” and all required submissions provided to the OWNER, a final estimate showing the value of the Work shall be prepared by the Engineer as soon as the necessary measurements and computations can be made. All prior payment applications upon which payments have been made are subject to necessary corrections or revisions in the final payment. The amount of the final payment application, less any sums that have been previously paid, deducted or retained under the provisions of this Contract, shall be paid to the CONTRACTOR within a reasonable period of time after final acceptance, provided that the CONTRACTOR has first furnished the OWNER:

- (1) a consent of surety to final payment;
- (2) the final CONTRACTOR'S Report of Subcontractor/Supplier Payment, evidencing that all indebtedness connected with the Work and all sums of money due for any labor, materials, apparatus, fixtures or machinery furnished for or used in the performance of the Work have been paid or otherwise satisfied, or that the person or persons to whom the same may be respectively due have consented to final payment;
- (3) such other affidavits, lien waivers and other documentation as the OWNER may reasonably require to protect its interests;
- (4) the Maintenance Bond; and
- (5) any and all operations and maintenance manuals or other documentation as the OWNER may require.

In addition, the CONTRACTOR shall be required to execute the OWNER'S standard Affidavit of Final Payment and Release as a precondition to receipt of final payment.

The acceptance by the CONTRACTOR of the final payment as aforesaid shall operate as and shall be a release to the OWNER from all claims or liabilities under the Contract, including all subcontractor claims, for anything done or furnished or relating to the Work under the Contract or for any act or neglect of said OWNER relating to or connected with the Contract.

All warranties and guarantees shall commence from the date of the certificate of final acceptance. No interest shall be due the CONTRACTOR on any partial or final payment or on the retainage.

SPECIAL CONDITIONS

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SC 2	Project Description
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SC 9	Freese and Nichols, Inc. Specifications
SC 10	Liquidated Damages
SC 11	Amendments to City of Frisco Technical Specifications
SC 12	Substantial Completion for Force Main FM-A and Lebanon Road Improvements

SC 1 - LOCATION

The Lebanon Road Improvements and Force Main project is located in Frisco, Texas. The roadway improvements along Lebanon Road are between Village Boulevard and Starwood Drive. The force main starts at the southwest corner of John Hickman and the Dallas North Tollway intersection and is located along the southern side of John Hickman, western side of Frisco Green, and the median of Lebanon Road before terminating at the Stewart Creek West Wastewater Treatment Plant.

SC 2 - PROJECT DESCRIPTION

The Lebanon Road Improvements and Force Main project generally includes the construction of approximately 4,065 LF of 18-inch force main and approximately 10,280 LF of 20-inch force main with 2,680 LF installed by horizontal directional drill. The remaining installation will be by open cut installation with approximately 2,060 LF of jack/bore/tunneling. This project also includes the widening of Lebanon Road between Village Blvd. and Starwood Drive. Pavement markings and traffic signal improvements are included with the widening portion of this project.

SC 3 - COMPLIANCE WITH CONTRACT DOCUMENTS

The CONTRACTOR agrees to comply with the requirements of the Contract Documents, all approved modifications thereof, and additions and alterations thereto approved in writing by the OWNER. The burden of proof of such compliance shall be upon the CONTRACTOR to show that it has complied with the said requirements of the Contract Documents, approved modifications thereof and all approved additions and alterations thereto.

SC 4 - MINIMUM WAGE RATES

The prevailing wage rates as adopted by City Resolution are determined applicable for this project and are made a part of these Contract Documents. Not less than these rates must be paid on this project.

SC 5 - PROJECT SIGNS

The Contractor shall supply 4 project signs in accordance with the details attached at the end of these special conditions. Signs shall be placed at the following locations:

1. East of Starwood Drive, in the median of Lebanon Road
2. East of Legacy Drive, in the median of Lebanon Road
3. West of 4th Army Drive, in the median of Lebanon Road
4. West of Legacy Drive, in the median of Lebanon Road

SC 6 - WORK WITH OWN FORCES

The CONTRACTOR shall perform with its own forces work of a value of not less than 50% of the contract amount.

SC 7 - FIELD OFFICE:

The CONTRACTOR will not be required to furnish a field office on this contract.

SC 8 - CLEAN-UP:

During construction the Contractor shall at all times keep the job site free from waste, debris and rubbish,

All trees, stumps, slashings, brush or other debris to be removed from the site, shall be disposed of in a manner approved by the OWNER. Burning of trash, etc., will only be permitted where allowed by Local Ordinances and State Pollution Regulations.

Surplus dirt or earth shall be removed from the site and satisfactorily disposed of unless otherwise directed by the OWNER.

Contractor shall remove surplus pipeline materials, tools, rubbish, and leave the construction site clean, to the satisfaction of the City. Grade the surface and re-establish drainage and erosion control. Removal of rock and other excess excavated material and general leveling, and grading of the median surface to a presentable appearance shall proceed so as to not be further than 1,500 feet behind the backfilling operations.

Upon completion of the work as a whole and prior to final acceptance, the CONTRACTOR shall clean and remove from the site all surplus and discarded materials, temporary structures and all debris. The CONTRACTOR shall leave the site in a neat and orderly condition with an appearance satisfactory to the OWNER. Method and location of disposal of surplus and waste materials shall be subject to the approval of the OWNER.

The CONTRACTOR shall then thoroughly clean all equipment and materials and shall present for final inspection materials and equipment in a clean, bright and new condition.

No extra payment will be made for any clean-up required on the project.

SC 9 - FREESE AND NICHOLS, INC. SPECIFICATIONS

The following FNI specifications have been added to the Contract Documents:

1. 01 29 00 Payment Procedures
2. 01 32 34 Video and Photographic Documentation
3. 01 33 00 Submittal Procedures
4. 01 33 00.01 Table of Required Submittals
5. 03 11 00 Concrete Forming
6. 03 30 00 Cast-In-Place Concrete
7. 09 96 00 High-Performance Coatings
8. 31 05 13 Soils for Earthwork
9. 31 05 16 Aggregates for Earthwork
10. 32 84 23 Landscape Irrigation
11. 33 05 23.13 Utility Horizontal Directional Drilling
12. 33 12 16.19 Eccentric Plug Valves

SC 10 – LIQUIDATED DAMAGES:

Liquidated damages are set at \$500.00 per calendar day in accordance with Item 7.8 in the General Conditions.

SC 11 – Amendments to City of Frisco Technical Specifications

The following is a list of amendments to the City of Frisco Technical Specifications:

1. All Specifications:
 - a. NSF-61 certification is not required.
 - b. Measurement and Payment for all City and FNI Project Specifications shall be per Specification 01 29 00, Payment Procedures, Paragraph 2.00.

2. NCTCOG 4th Edition, 501.14 Polyvinyl Chloride (PVC) Water Pipe (As referenced in 33 11 14)

Reference Page 501-17, Subparagraph 501.14.4
Modification: Modify 5.14.4 Joints to read: PVC water pipe shall be furnished with gasketed joints **or butt-fused welded joints in directional drilling locations as indicated in the Contract Drawings.**”

3. Section 32 13 13 Concrete Pavement

Reference Page 1, Paragraph 2.01, Materials
Modification: Modify Paragraph E as follows:
“*Public Works Construction Standards*, NCTCOG, 4th Edition, Items 303.2.2 is hereby modified to allow only Type I/II **and III** Portland Cement

Reference Page 1, Paragraph 2.01, Materials
Addition: Add the following as Paragraph F.
“Concrete Pavement for roadway and driveway repair shall be high early strength Type III Portland cement, with a minimum allowable 7-day strength of 4,200 psi.”

4. Section 32 92 23 Turfgrass Planting

Reference Page 2, Paragraph 2.03
Deletion: Delete Paragraph 2.03.
~~“2.03 Hydraulic Mulch Materials
A. Refer to Public Works Construction Standards, NCTCOG 4th Edition, Item 202.6.4.4.
B. Public Works Construction Standards, NCTCOG 4th Editions, Item 202.6.4.4 is hereby modified by excluding the compliance with NCTCOG Item 202.4 Fertilizer.
C. Fertilizer for hydraulic mulching will comply with the requirements of this specification.”~~

Reference Page 4, Paragraph 3.04.A
Deletion: Delete Paragraph 3.04.A.2
~~“Hydraulic Mulch (where required): Refer to Public Works Construction Standards, NCTCOG 4th Edition, Item 202.6.4.4.~~

5. Section 33 05 23 Trenchless Utility Installation

Reference Page 1, Paragraph 1.03, A
Modification: “The pipe casing (or carrier pipe on uncased bores) ~~shall be~~ **has been** designed by a Licensed Professional Engineer for the following loading conditions and applicable combinations thereof:”

Reference Page 2, Paragraph 1.04, Submittals
Deletion: Delete Paragraph D.
~~“Provide Pressure Grout material and method.”~~

Reference Page 3, Paragraph 3.02, Installation of Carrier Pipe

Modification: Modify the first sentence of Paragraph 3.02, C as follows:

“Carrier pipe shall meet the requirements of the applicable Specification section. Remove all loose soil from casing. Grind smooth all rough welds at casing joints. Provide casing spacers, or insulators, or other approved devices, as required, to prevent flotation, movement, or damage to the pipe during installation ~~and annular space grout placement.~~”

Reference Page 3, Paragraph 3.02 Installation of Carrier Pipe

Deletion: Delete paragraph C:

~~“Backfill Annular Space with Grout: After the installation of the carrier pipe, the annular space (all voids) between the casing and the carrier shall be filled with grout so all remaining surfaces of the exterior carrier pipe wall and casing interior are in contact with the grout. Furnish the necessary grout, equipment, hoses, valves, and fittings for the backfilling operation. Grout shall be pumped through a pipe or hose. Use grout pipes, or other appropriate materials to avoid damage to carrier pipe during grouting. The grout shall be proportioned to flow and to completely fill all voids between the carrier pipe and the casing. The Contractor shall provide end seals, as approved by the Engineer at each end of the casing to contain the grout backfill. The end seals shall be designed to withstand the anticipated grouting pressure and be watertight to prevent groundwater from entering the casing. Block the carrier pipe during grouting to prevent flotation during grout installation. The Contractor shall also protect and preserve the interior surfaces of the casing from damage. It is the responsibility of the Contractor to submit to the Engineer sufficient information indicating all proposed equipment, materials, and the method for filling this void.”~~

6. Section 33 11 13 Ductile Iron Pipe and Fittings

Reference Page 3, Paragraph 2.02 DUCTILE IRON FITTINGS

Modification: Modify Paragraph B to read: “Mechanical joints shall be furnished complete with accessories. Bolts and nuts shall be stainless steel **or ASTM 242 high-strength low-alloy steel.**”

Reference Page 3, Paragraph 2.02 DUCTILE IRON FITTINGS

Addition: Add Paragraph F to read: “**Wastewater force main ductile iron fittings shall be lined with factory installed Protecto 401 Ceramic Epoxy Lining by Enduron or American Polybond Plus (fusion bonded epoxy and fusion bonded polyethylene) or an approved equal. Lining primers, applications, and thicknesses shall be in accordance with manufacturer’s recommendations for sanitary sewer applications, but shall not be less than 40 mils.**”

Reference Page 4, Paragraph 3.02, H

Deletion: Delete Paragraph H: “~~New tracer wire shall be installed in the trench with all water mains with a terminal box located in each water main valve pad.~~”

Reference Page 5, Paragraph 3.04

Deletion: Delete Paragraph 3.04, PURGING AND DISINFECTION

7. Section 33 11 14 PVC for Water Distribution

Reference Page 1, Paragraph 2.01 B

Modification: Modify the section to read: “Pipe shall be manufactured in the United States of America and shall be ~~blue in color~~ **colored white to designate a wastewater force main and shall be stenciled with standard pipe markings and “Forced Sewer.”**”

Reference Page 2, Paragraph 3.02, F

Addition: Add the following Paragraph F: **“F. Continuous 6-inch wide detectable tape, Terra Tape Sentry Line Reinforced Detectable Tape or approved equal shall be installed over the top of all buried lines. Shall be colored and labeled in accordance with the TCEQ color code. Force Main tape shall be green and labeled “CAUTION FORCED SEWER BURIED BELOW” spaced every 36-inches maximum.**

Reference Page 2, Paragraph 3.04

Deletion: Delete Paragraph 3.04 PURGING AND DISINFECTION

8. Section 33 12 16 Air Valves for Potable Water Systems and Wastewater Force Mains

Reference Page 1, Paragraph 2.01 B

Deletion: Delete Paragraph B ~~“B. Air valves for potable water systems shall be Veto-Mat Series RBX or approved equal.”~~

9. Section 33 12 17 Gate Valves

Reference Page 2, Paragraph 3.02

Clarification: Gate valve hydrostatic test pressure of 400 psi is for factory (production) tests only, not field tests, in accordance with AWWA C-509.

10. Section 33 12 60 Mechanical Restraint for PVC and Ductile Iron Pipe

Reference Page 1, Paragraph 2.01

Addition: Add the following Paragraph B: **“B. Mechanical Joint Restraints shall have 304 SS hardware and EBBA MEGA-BOND coating system (blue in color), or approved equal.”**

SC 12 – SUBSTANTIAL COMPLETION FOR FORCE MAIN FM-A AND LEBANON ROAD IMPROVEMENTS

The definition of substantially complete for Force Main FM-A includes all compaction tests passed and all required pipeline testing has been complete and accepted. 100 percent of Force Main FM-A must be substantially complete in full within 300 calendar days from the Notice to Proceed otherwise none of the remaining items will be paid. Liquidated damages will be assessed beginning on the 301st calendar day after the Notice to Proceed until Force Main FM-A is substantially complete.

The definition of substantially complete for the Lebanon Road Improvements includes all permanent improvements necessary to allow vehicular and pedestrian traffic to use the facility in accordance with final geometric conditions, finished grades, and permanent safety devices shown in the Contract Documents. Roadway illumination shall be considered a permanent safety device. 100 percent of the Lebanon Road Improvements must be substantially complete in full within 300 calendar days from the Notice to Proceed otherwise none of the item will be paid. Liquidated damages will be assessed beginning on the 301st calendar day after the Notice to Proceed until the Lebanon Road Improvements are substantially complete.

SECTION 3
TECHNICAL SPECIFICATIONS

DIVISION 01
GENERAL REQUIREMENTS

01 29 00 PAYMENT PROCEDURES

GENERAL

1.01 WORK INCLUDED

1.00

- A. Payments for Work shall conform to the provisions of the General Conditions, the Supplementary Conditions, the Agreement, and this Section. Apply provisions for payments in the Section to all Subcontractors and Suppliers.
- B. Submit Applications for Payment at the amounts indicated in the Agreement:
 - 1. Amounts for each item in the Agreement shall include but not be limited to cost for:
 - a. Mobilization, demobilization, cleanup, bonds, and insurance.
 - b. Professional services including but not limited to engineering and legal fees.
 - c. The products to be permanently incorporated into the Project.
 - d. The products consumed during the construction of the Project.
 - e. The labor and supervision to complete the Project.
 - f. The equipment, including tools, machinery, and appliances required to complete the Project.
 - g. The field and home office administration and overhead costs related directly or indirectly to the Project.
 - h. Any and all kinds, amount or class of excavation, backfilling, pumping or drainage, sheeting, shoring and bracing, disposal of any and all surplus materials, permanent protection of all overhead, surface or underground structures; removal and replacement of any poles, conduits, pipelines, fences, appurtenances and connections, cleaning up, overhead expense, bond, public liability and compensation and property damage insurance, patent fees, and royalties, risk due to the elements, and profits, unless otherwise specified.
 - 2. Provide Work not specifically set forth as an individual payment item but required to provide a complete and functional system. These items are a subsidiary obligation of the Contractor and are to be included in the Cost of Work.
 - 3. Payment will be made for materials on hand.
 - a. Store materials properly on Site per the Owner's requirements.
 - 1). Payment will be made for the invoice amount less the specified retainage.
 - 2). Provide invoices at the time materials are included on the materials-on-hand tabulation.
 - b. Provide documentation of payment for materials-on-hand with the next payment request. Adjust payment to the amount actually paid if this differs from the invoice amount. Remove items from the materials on hand tabulation if this documentation is not provided so payment will not be made.
 - c. Payment for materials-on-hand is provided for the convenience of the Contractor and does not constitute acceptance of the product.

4. The Work covered by progress payments becomes the property of the Owner at the time of payment.

1.02 SCHEDULE OF VALUES AND PAYMENTS

- A. Submit a detailed Schedule of Values for the Work to be performed on the project.
 1. Submit schedule within 10 days prior to submitting the first Application for Payment.
 2. Line items in the Agreement are to be used as line items in the schedule.
 3. Payment will be made on the quantity of Work completed per Contract Documents during the payment period and as measured per this Section.
 - a. Payment amount is the Work quantity measured multiplied by the unit prices for that line item in the Agreement.
 - b. Payment on a unit price basis will not be made for Work outside finished dimensions shown in the Contract Documents.
 - c. Partial payments will be made for lump sum line items in the Agreement.
 - 1). Lump sum line items in the Agreement are to be divided into smaller unit prices to allow more accurate determination of the percentage of the item that has been completed.
 - a). Provide adequate detail to allow more accurate determination of the percentage of Work completed for each item.
 - b). Provide amounts for items that do not exceed \$50,000.00. An exception may be made for equipment packages that cannot be subdivided into units or subassemblies.
 - c). Separate product costs and installation costs.
 - (1). Product costs include cost for product, delivery and unloading costs, royalties and patent fees, taxes, and other cost paid directly to the Subcontractor or Supplier.
 - (2). Installation costs include cost for the supervision, labor and equipment for field fabrication, erection, installation, start-up, initial operation and overhead and profit.
 - d). Lump sum items may be divided into an estimated number of units.
 - (1). The estimated number of units times the cost per unit must equal the lump sum amount for that line item.
 - (2). Payment will be made for all of the lump sum line item amount.
 - e). Include a directly proportional amount of overhead and profit for each line item.
 - f). Divide principal subcontract amounts into an adequate number of line items to allow determination of the percentage of Work completed for each item.
 - 2). These line items may be used to establish the value of Work to be added or deleted from the Project.

- 3). Correlate line items with other administrative schedules and forms:
 - a). Progress schedule.
 - b). List of Subcontractors.
 - c). Schedule of allowances.
 - d). Schedule of alternatives.
 - e). List of products and principal Suppliers.
 - f). Schedule of Submittals.
- 4). Costs for mobilization shall be listed as a separate line item and shall be actual cost for:
 - a). Bonds and insurance.
 - b). Transportation and setup for equipment.
 - c). Transportation and/or erection of all field offices, sheds and storage facilities.
 - d). Salaries for preparation of submittals required before the first Application for Payment.
 - e). Salaries for field personnel assigned to the Project related to the mobilization of the Project.
 - (1). Mobilization may not exceed 5 percent of the total Contract amount. Cost for mobilization may be submitted only for Work completed.
- 5). The sum of all values listed in the schedule must equal the total Contract amount.
4. Submit a schedule indicating the anticipated schedule of payments to be made by the Owner. Schedule shall indicate:
 - a. The Application for Payment number.
 - b. Date the request is to be submitted.
 - c. Anticipated amount of payment to be requested.
5. Update the Schedule of Values quarterly or more often if necessary to provide a reasonably accurate indication of the funds that the Owner will need to have available to make payment to the Contractor for the Work performed.
- B. Provide written approval of the Schedule of Values, Application for Payment form, and method of payment by the Surety Company providing performance, and bonds prior to submitting the first Application for Payment. Payment will not be made without this approval.

1.03 PAYMENT PROCEDURES

- A. Submit Applications for Payment per the procedures indicated in Section 01 33 00 "Submittal Procedures." Submit a Schedule of Values in the Application for Payment format to be used.

- B. Applications for Payment may be submitted on a pre-printed form as indicated in Section 01 33 00 "Submittal Procedures" or may be generated by computer. Computer generated payment requests must have the same format and information indicated in the pre-printed form and be approved by the Owner.
1. Submit a Schedule of Values in the payment request format to be used.
 - a. Request must include a completed Summary of Payment Request Values as required by the Owner with each estimate submitted.
 - 1) Each request must be sequentially numbered and the payment period indicated.
 - 2) Total amounts for Value of Original Contract Performed, Extra Work on Approved Change Orders, and Materials-on- Hand are to be shown on the Summary Sheet and are to correspond to totals indicated on the attached tabulation for each.
 - 3) The number of pages included in each tabulation is to be noted in the blank space on the Summary Sheet to allow a determination to be made that all sheets have been submitted.
 - 4) Contractor's certification must be executed by the Contractor's agent of authority and notarized for each payment request.
 2. The Schedule of Values and the form for the submission of requests may not be altered without the express written consent of the Owner.
 3. Final payment requires additional procedures and documentation in accordance with the Owner's requirements.
- C. Progress payments shall be made as the Work progresses on a monthly basis.
1. End the payment period on the 25th day of each month and submit an Application for Payment for Work completed and materials received since the end of the last payment period.
 2. At the end of the payment period, submit a draft copy of the Application for Payment for that month to the Owner. Agreement is to be reached on:
 - a. The percentage of Work completed for each lump sum item.
 - b. The quantity of Work completed for each unit price item.
 - c. The percentage of Work completed for each approved Change Order item.
 - d. The amount of materials-on-hand.
 3. On the basis of these agreements the Contractor is to prepare a final copy of the Application for Payment and submit it to the Owner for approval.
 4. The Owner will review the Application for Payment.
2. Each payment request is to be accompanied by a revised and up-to-date progress schedule in accordance with the requirements of the Owner.
 3. Each payment request is to be accompanied by Project Photographs in accordance with the requirements of the Owner.

1.04 MEASUREMENT PROCEDURES

- A. Measure the Work described in the Agreement for payment. Payment will be made only for the actual measured and/or computed length, area, solid contents, number and weight, unless otherwise specifically provided. No extra or customary measurements of any kind will be allowed.

BID ITEMS

2.01 GENERAL ITEMS

2.00 Item No.: A1 – General Site Preparation

Measurement for General Site Preparation shall be made on a lump sum basis. Payment for General Site Preparation shall be made at the unit price bid and shall be full compensation for the items listed in NCTCOG Section 203.3, which includes the removal and disposal of driveways, paved parking areas, miscellaneous stone, brick, concrete sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, all rubbish and debris, whether above or below ground except live utility facilities. This Item shall also include the removal and disposal of designated stumps, bushes, vegetation, roots, shrubs, brush, and logs. It is the intent of NCTCOG Section 203.3 to provide for the removal and disposal of all obstructions and objectionable materials not specifically provided for elsewhere in the plans and specifications. This Item does not include the removal and disposal of hazardous material. Removal of existing pavement, curb and gutter, and existing trees shall be measured separately.

Item No.: A2 – Storm Water Pollution Prevention Plan

Storm Water Pollution Prevention Plan will be measured by the month. Payment for SWPPP shall be made at the price bid per month, and shall be full compensation for design and implementation of the plan for the duration of the project in accordance with the Contract Documents, including all clearing and grubbing, removals, excavation and backfill required for installation, installation, maintenance, removals and restoration and all labor, tools, equipment, overhead, profit and incidentals necessary to complete the work in accordance with the SWPPP. A minimum of 70% vegetation must be established prior to removing erosion control measures. Plan shall be prepared in accordance with the Texas Commission on Environmental Quality (TCEQ) and City requirements. Payment for this item will begin on the first estimate after the SWPPP is approved and temporary erosion control measures have been installed in accordance with the SWPPP and construction has begun. Payment will be made each succeeding month for this item provided the temporary erosion control measures have been installed and maintained in accordance with the SWPPP until final completion. The SWPPP shall be a phased SWPPP approved by the Owner such that the SWPPP is executed in parts that only support direct constructions activities.

Item No.: A3 – Project Sign

Measurement for project signs shall be per each sign installed. All work performed and materials furnished in accordance with this Item and measured per each will be paid for at the unit bid price for “Project Sign” in accordance with the City of Frisco’s Standard Detail for Project Sign. This price is full compensation for all material, labor, equipment, tools and superintendence necessary to furnish and install Project Signs.

Item No.: A4 – Trench Safety

Measurement for trench safety shall be per linear foot installed. Payment for trench safety shall be made at the unit price bid per linear foot installed and shall be full compensation for trench safety as outlined in the Project Specifications. This bid item covers trench safety for all excavations required on the project and is not limited to only pipe installation.

Item No.: A5 – Barricades, Signs, and Traffic Handling

Measurement and Payment for Barricades, Signs, and Traffic Handling shall be per month as described in 34 71 13, Barricades, Signs, and Traffic Handling.

2.02 FORCE MAIN

Item No.: B1 – RFID Markers

RFID Markers shall be measured on a per each basis for each RFIC marker, complete and in place. All work performed and materials furnished in accordance with this item will be paid for at the unit price bid for “RFID Marker” of the type specified. This price is full compensation for all material, labor, equipment, instrumentation, training, data documentation, tools, and superintendence necessary to complete the work, including installing the RFID markers and providing the spreadsheet.

Item No.: B2 – Jack, Bore, or Tunnel (Steel Casing) (36”)

Measurement for jack, bore, or tunnel steel casing pipe shall be per linear foot of casing pipe installed for the nominal diameter and thickness listed in the Proposal, shown on the Contract Drawings, and in accordance with the details shown in the Contract Drawings and Project Specifications.

Payment for jacked, bored or tunneled crossings shall be made at the unit price bid per linear foot and shall include all costs for the pits or shafts as required to construct the bore, bulkheads, guide rails, casing spacers, welding, special backfill, mechanically restrained joints, end seals, special insurance, flagmen, and all other items as shown on the Contract Drawings and required for installation. Payment for the carrier pipe inside the casing is NOT included in this bid item.

Item No.: B3 – Force Main – Fusible PVC (DR 18)(20”)(Horizontal Directional Drill); B9 – Force Main – PVC (DR 18) (12”); B10 – Force Main – PVC (DR 18) (18”); B11 – Force Main – PVC (DR 18) (20”)

Measurement for Fusible PVC Pipe, Flanged Ductile Iron Pipe, Restrained Ductile Iron Pipe, and PVC Pipe with ductile iron fittings shall be per linear foot of pipe installed by open-cut, as carrier pipe in steel encased bores, or by directional drilling for the nominal diameter and at the dimension ratios and pressure classes listed in the Proposal and shown on the Contract Drawings, measured horizontally from center of fitting to center of fitting or end of

pipe without any deduction for the length of intermediate specials, fittings, or valves. No additional payment will be made for vertical lengths of pipe.

Payment shall be made at the unit price bid per linear foot and shall be for pipe and any required ductile iron fittings. Payment shall include furnishing, hauling and laying of pipe and fittings; threaded outlets for venting and sampling as required; pipe restraint and concrete blocking; fusing; trench excavation, shoring and pumping where necessary; backfilling of trench, including embedment material; detector tape; pipeline markers; polyethylene encasement and tape; dirt road or driveway replacement; replacement of topsoil; replacing existing landscaping and irrigation systems to a condition equal to or better than existed prior to construction; protecting or replacing existing structures and utilities not specifically called out in the plans, including but not limited to cable, water service connections, power poles and guy wires, buried electric services, buried telephone cable, buried fiber optic cable, buried street light electric cable and conduit, etc.; protecting or replacing existing irrigation and sprinkler systems; disposal of surplus materials; cleaning up and maintenance; removal and replacement of brick, masonry, wood, or any other type of driveway entrance or median nose; installing new pavement markings as required; sign removal and replacement; surveying and replacement of monuments; dust control; removal of mud from roadways; all testing required by TCEQ and these documents; connections (wet or dry) to existing waterlines, including all fittings and adaptors that might be required, unless otherwise noted; and any incidental work and materials not otherwise provided for in the Section, all in strict accordance with the Contract Drawings and Project Specifications.

Payment for pipe shall include all extra precautions or construction requirements necessary to adequately protect and support existing utilities and relocate existing utilities as necessary for construction of main line pipe. The Contractor is responsible for all fees assessed by utility companies to provide utility support for existing utility lines or relocation, at no additional cost to the Owner. Payment shall include all costs required to have utility companies repair any damage to their lines caused by the Contractor's activities and any cleanup, property damages, fines, etc. resulting from damage caused by the Contractor.

Payment for directional drilling shall be full compensation for all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and erosion and sedimentation control and restoration, complete in place, work fully performed.

No separate payment shall be made for rock excavation, and cost thereof shall be included in the unit price bid. All special easement requirements, as listed on the Contract Drawings or in the Project Specifications, shall be made incidental to this bid item.

Payment for connecting to the existing force main is subsidiary to this item.

Item No.: B4 - 2" Combination Air Release Valve

Measurement for air release valve assemblies shall be per each installed complete and in place. Payment for air valves shall be made at the unit price bid per each and shall be full compensation for furnishing and installing the complete assembly, including pipe outlet, valves, valve box pad, tubing, coupling, Vent-O-Mat RGX 50 1021 air valve, manhole, vent piping and support, and all other items required for installation at the locations indicated in the Contract Drawings, and in accordance with the Project specification and detail.

Item No.: B5 – Reuse Water Line 2" Combination Air Release Valve

Measurement for the reuse water line air release valve assembly shall be considered as a complete unit installed and in place. Payment for the reuse water line air release valve shall be made at the unit price bid per each and shall be full compensation for removing the existing assembly and furnishing and installing all items necessary to move the existing assembly including pipe outlet, casing, valves, valve box pad, tubing, coupling, manhole, vent piping and support, and all other items required for installation at the location indicated in the Contract Drawings, and in accordance with the Project specification and detail. This pay item shall include the removal and reinstallation of the existing combination air release valve.

Item No.: B6– Plug Valve (12"); B7 – Plug Valve (18"); B8 – Plug Valve (20")

Measurement for plug valves shall be per each installed for the nominal size and type listed in the Proposal and shown on the Contract Drawings. Payment for valves shall be made at the unit price bid per each for this item and shall be full compensation for furnishing and installing plug valves as indicated on the Contract Drawings, including valves, valve box pad, operators, valve risers, stems, stainless steel bolts, boxes, backfill, all other items required for installation, and stated in NCTCOG Section 502.6.8 and City Standards.

2.03 ROADWAY

Item No.: C1 – Remove Concrete Pavement

Measurement for removal of existing concrete pavement shall be per square yard removed regardless of thickness and type in the locations show on the Contract Drawings. Payment for removal of concrete pavement shall be made at the unit price bid for this item and shall be full compensation for removal and disposal of existing concrete including monolithic curb and curb and gutter in the locations shown in the Contract Drawings, including labor, equipment, materials, hauling, disposal, and all other items required for removal.

Item No.: C2 – Excavation (Roadway)

Measurement and Payment for Roadway Excavation shall be per cubic yard as described in 31 23 16, Excavation (Roadway).

Item No.: C3 – Flexible Base (Complete in Place)(TY-D GR-1-2)(12")

Measurement and Payment for Flexible Base (Complete in Place)(TY-D GR-1-2)(12") shall be per square yard as described in 32 11 16, Flexible Subbase or Base (Crushed Stone/Concrete) including payment for geogrid specified in the plans.

Item No.: C4 – Reinforced Concrete Pavement

Measurement and Payment for Reinforced Concrete Pavement shall be per square yard as described in 32 13 13, Concrete Pavement.

Item No.: C5 – Concrete Median Nose (Type 2)

Measurement and Payment for Concrete Median Nose (Type 2) shall be per each as described in 32 16 30, Concrete Median Nose.

Item No.: C6 – Pavement Markers & Markings (Type I & II)(Y)(4”); Item No.: C7 – Pavement Markers & Markings (Type I & II)(W)(8”); Item No.:C8 – Pavement Markers & Markings (Type I & II)(Y)(12”); Item No.: C9 – Pavement Markers & Markings (Type I & II)(W)(24”)

Measurement and Payment for Items C6, C7, C8, and C9 shall be per linear foot installed as described in 32 17 23, Pavement Markers and Markings.

Item No.: C10 – Pavement Markers & Markings (Type I & II)(W)(Arrow); Item No.: C11 – Pavement Markers & Markings (Type I & II)(W)(Word)

Measurement and Payment for Items C10 and C11 shall be per each installed as described in 32 17 25, Prefabricated Pavement Markings (With Warranty).

Item No.: C12 – Raised Pavement Marker (Type II-A-A)

Measurement and Payment for Raised Pavement Marker (Type II-A-A) shall be per each installed as described in 32 17 23, Pavement Markers and Markings.

Item No.: C13 – Pavement Marker Removal

Measurement for Pavement Marker Removal shall be per linear foot removed in the locations shown in the contract drawings. Payment for Pavement Marker Removal shall be made at the unit price bid for this item and shall be full compensation for removal of existing pavement markers in the locations shown in the contract drawings, including labor, materials, equipment, tools, and all other items required for removal.

Item No.: C14 – Traffic Signal Modifications

Measurement for Traffic Signal Modification shall be per each intersection location indicated on the Contract Drawings. Payment for Traffic Signal Modifications include all materials and labor for work described in Specification 34 41 13, Installation of Highway Traffic Signals necessary to restore fully functional signal operations for all labor and materials not paid for separately by other items provided in the contract.

Item No.: C15 – Vehicle and Pedestrian Signal Heads

Measurement and payment shall be per each as described in 34 41 25, Vehicle and Pedestrian Signal Heads.

Item No.: C16 – Traffic Signal Cable

Measurement and payment shall be per linear foot installed as described in 34 41 30, Traffic Signal Cable.

Item No.: C17 – Single Post Small Signs

Measurement and Payment for Single Post Small Signs shall be per each as described in 34 41 50, Small Roadside Sign Supports and Assemblies.

Item No.: C18 – Double Post Small Signs

Measurement and Payment for Double Post Small Signs shall be per each in accordance with 34 41 50, Small Roadside Sign Supports and Assemblies with the following exception: Payment will not be made for new sign panel; City will provide the new sign panel. Payment will be for furnish and install all other items required for sign installation per 34 41 50.

Item No.: C19 – Replace Roadway Light Fixtures (Supplied by Others)

Measurement shall be on a per Each (EA) basis, complete in place. Payment shall be per 26 56 20 except that the luminaire fixtures will be provided by the city.

Item No.: C20 – Relocate Luminaire Pole

Measurement shall be on a per Each (EA) basis, complete in place. Contractor shall store existing luminaire poles at a location agreeable to the City and shall not store existing luminaire poles on the project site. Payment shall include all labor and materials including foundations, pull boxes, conduit, and conductors as required to relocate existing luminaire poles and restore full operation of the lighting system.

2.04 LANDSCAPE ARCHITECTURE

Item No.: D1 – Hydraulic Mulch Seeding

Measurement for hydraulic mulch seeding shall be per square yard installed. Payment for hydraulic mulch seeding shall be made at the unit price bid per square yard and shall be full compensation for broadcast seeding installed in all areas disturbed by construction inside permanent easements, temporary construction easements, and roadway right-of-way at the locations noted in the plans. Hydraulic mulch seeding shall not be installed within two-feet of curbs – see Bid Item D2, Sod. Payment shall include topsoil, fine grading, fertilizer, temporary irrigation as necessary, labor, materials and equipment necessary to install the seeding, care for, and maintain the areas seeded until grass is established. Areas disturbed outside those indicated and adjacent to other broadcast seeded areas will not be measured but are required to be restored and broadcast seeded under the price bid for this item.

Item No.: D2 – Sod

Measurement for sod shall be per square yard installed. Payment for sod shall be made at the unit price bid per square yard, and shall include all materials and labor necessary to furnish and install sodding, topsoil, fine grading, fertilizer, and temporary irrigation as necessary in all areas disturbed by construction inside permanent easements, temporary construction easements, and roadway right-of-way at the locations noted in the plans. When existing turf is disturbed along a curb, sod shall be installed in a two-foot strip along the curb. Payment shall include labor, materials and equipment necessary to install the sodding, care for, and maintain the areas until grass is established. Areas disturbed outside those indicated and adjacent to other sodded areas will not be measured but are required to be restored and sodded under the price bid for this item.

Item No.: D3 – Removal of Existing Trees

Measurement for removal of existing trees shall be measured per each tree removed in the areas indicated on the Contract Drawings. Contractor shall only remove trees specifically noted on the Contract Drawings. Payment for removal of existing trees shall be made at the unit price bid per each tree. Payment shall be full compensation for removal of trees indicated on Contract Drawings and include removal, hauling, disposal, labor, equipment and all other items required to remove the trees indicated on the Contract Drawings.

Item No.: D4 – Street Trees

Measurement for Street Trees shall be measured per each tree in the locations indicated on the Contract Drawings. Contractor shall only install trees in the area specifically noted on

the Contract Drawings. Payment for street tree installation shall be made at the unit price bid per each tree. Payment shall be full compensation for furnishing and installing a tree of the size and species indicated in the Contract Drawings, topsoil, staking, fertilizer and watering until germination occurs with the new tree and all other appurtenance work required, complete and in place.

Item No.: D5 – Booster Shrubs as Booster Pump Station

Measurement for Booster Shrubs shall be per each installed in the locations indicated on the contract drawings. Payment for Booster Shrubs shall be made at the unit price bid per each shrub. Payment shall be full compensation for furnishing and installing a shrub of the size and species indicated in the Contract Drawings, topsoil, staking, fertilizer and watering and all other appurtenance work required, complete and in place.

Item No.: D6 – Landscape Irrigation

Measurement for Landscape Irrigation shall be made on a lump sum basis. Payment for Landscape Irrigation shall be made at the unit price bid and shall be full compensation for furnishing and installing an irrigation system in the areas indicated on the Contract Drawings including valves, meters, backflow preventers, controllers, irrigation lines, labor, equipment, and all other items and work required, complete and in place.

END OF SECTION

01 32 34 VIDEO AND PHOTOGRAPHIC DOCUMENTATION

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide a video recording and photographs of the Site prior to the beginning of construction.
 - 1. Record the condition of all existing facilities in or abutting the construction area (right-of-way) including but not limited to streets, curb and gutter, utilities, driveways, fencing, landscaping, etc.
 - 2. Record after construction staking is complete but prior to any clearing.
 - 3. Provide one copy of the recording, dated and labeled to the City before the start of construction. Provide additional recording as directed by the City if the recording provided is not considered suitable for the purpose of recording pre-existing conditions.
- B. Furnish an adequate number of photographs of the Site to clearly depict the completed Project.
 - 1. Provide a minimum of ten different views.
 - 2. Photograph all significant areas of completed construction.
 - 3. Completion photographs are not to be taken until all construction trailers, excess materials, trash and debris have been removed.
 - 4. Employ a professional photographer approved by the City to photograph the Project.
- C. All photographs, video recordings and a digital copy of this media are to become the property of the Owner. Photographs or recordings may not be used for publication, or public or private display without the written consent of the Owner.

1.02 QUALITY ASSURANCE

- A. Provide clear photographs and recordings taken with proper exposure. View photographs and recordings in the field and take new photographs or recordings immediately if photos of an adequate print quality cannot be produced or video quality is not adequate. Provide photographs with adequate quality and resolution to permit enlargements.

1.03 SUBMITTALS

- A. Submit photographic documentation as record data in accordance with Section 01 33 00 "Submittal Procedures."
- B. Submit two DVDs of the video recording as record data in accordance with Section 01 33 00 "Submittal Procedures."

2.00 PRODUCTS

2.01 PHOTOGRAPHS

- A. Provide photographs in digital format with a minimum resolution of 1280 x 960, accomplished without a digital zoom.
- B. Take photographs at locations acceptable to the City.
- C. Provide two color prints of each photograph and a digital copy on a DVD of each photograph taken.
- D. Identify each print on back with:
 - 1. Project name.
 - 2. Date, time, location, and orientation of the exposure.
 - 3. Description of the subject of photograph.
- E. Submit photograph in clear plastic sheets designed for photographs. Place only one photograph in each sheet to allow the description on the back to be read without removing the photograph.
- F. Final photographs are to include two 8-by-10-inch glossy color prints for each of ten photographs selected by the Owner. These photographs are in addition to normal prints.

2.02 VIDEO RECORDING

- A. Provide digital format on DVD that can be played with Windows Media Player in common format in full screen mode.
- B. Identify Project on video by audio or visual means.
- C. Video file size should not exceed 400 MB.
- D. Video resolution shall be 1080p.
- E. The quality of the video must be sufficient to determine the existing conditions of the construction area. Camera panning must be performed while at rest, do not pan the camera while walking or driving. Camera pans should be performed at intervals sufficient to clearly view the entire construction area.
- F. DVD shall be labeled with construction stationing and stationing should be called out, voice recorded, in the video.
- G. The entire construction area recording shall be submitted at once. Sections submitted separately will not be accepted.
- H. Pipeline projects should be recorded linearly from beginning to end.

END OF SECTION

01 33 00 SUBMITTAL PROCEDURES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and Engineer to:
 - 1. Record the products incorporated into the Project for the Owner.
 - 2. Provide information for operation and maintenance of the Project.
 - 3. Provide information for the administration of the Contract.
 - 4. Allow the Engineer to advise the Owner if products proposed for the Project by the Contractor conform, in general, to the design concepts of the Contract Documents.
- B. Contractor's responsibility for full compliance with the Contract Documents is not relieved by the Engineer's review of submittals. Contract modifications can only be approved by Change Order or Field Order.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Review and certify all submittals prior to submission.
- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction requirements.
 - 3. Location of all existing structures, utilities and equipment related to the submittals.
 - 4. Submittals are complete for their intended purpose.
 - 5. Conflicts between the submittals related to the various Subcontractors and Suppliers have been resolved.
 - 6. Quantities and dimensions shown on the submittals.
- C. Submit information per the procedures described in this section and the Specifications.
- D. Furnish the following submittals:
 - 1. As specified in the attached Submittal Schedule.
 - 2. Schedules, data and other documentation as described in detail in this section or referenced in the General Conditions and Contract Documents.
 - 3. Documentation required for the administration of the Contract as required by the Owner.
 - 4. Shop Drawings required for consideration of a contract modification per Paragraph 1.08.
 - 5. Submittals as required in the Specifications.
 - 6. Submittals not required will be returned without Engineer's review.

- E. Submit a schedule indicating the date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the Project. Make submittals promptly in accordance with the schedule to cause no delay in the Project.
 - 1. Send submittals to the Engineer allowing a reasonable time for delivery, review and marking submittals. Include time for review of a resubmission if necessary. Allow adequate time for the submittal review process, ordering, fabrication, and delivery of the product to not delay progress on the Project.
 - 2. Schedule submittal to provide all information for interrelated Work at one time. No review will be performed on submittals requiring coordination with other submittals. Engineer will return submittals for resubmission as a complete package.
- F. Submit information for all of the components and related equipment required for a complete and operational system in the same submittal.
 - 1. Include electrical, mechanical, and other information required to indicate how the various components of the system function.
 - 2. Provide certifications, warranties, and written guarantees with the submittal package for review when they are required.
 - 3. Fabrication or installation of any products prior to the approval of Shop Drawings is done at the Contractor's risk. Products not meeting the requirements of Contract Documents are defective and may be rejected at the Owner's option.
- G. Payment will not be made for products for which submittals are required until the submittals have been received. Payment will not be made for products for which Shop Drawings or Samples are required until these are approved by the Engineer.

1.03 QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear, easily understood manner. Submittals not meeting these criteria will be returned without review.
- B. Demonstrate that the proposed products are in full and complete compliance with the design criteria and requirements of the Contract Documents including Drawings and Specifications as modified by Addenda, Field Orders, and Change Orders.
- C. Furnish and install products that fully comply with the information included in the submittal.

1.04 SUBMITTAL PROCEDURES

- A. Submit an electronic copy of each submittal through the Project portal (website) provided by the Engineer. The Contractor will be provided access to log onto the website to post submittal documents and check the status of submittals.
 - 1. The complete contents of each submittal, including associated drawings product data, etc., shall be submitted in Portable Document Format (PDF). Submit PDF document with adequate resolution to allow documents to be printed in a format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 papers.

2. Create and submit color PDF documents where color is important to the evaluation of the submittal and / or where comments will be lost if only black and white PDF documents are provided. Submit Samples and color charts per Paragraph 1.04.H.
- B. Transmit all submittals, with a properly completed Submittal Transmittal Form as provided by the Engineer.
1. Use a separate transmittal form for each specific product, class of material, and equipment system.
 2. Submit items specified in different sections of the Specifications separately unless they are part of an integrated system.
- C. Assign a submittal number to the documents originated to allow tracking of the submittal during the review process.
1. Assign the number consisting of a prefix, a sequence number, and a letter suffix. Prefixes shall be as follows:

Prefix	Description	Originator
AP	Application for Payment	Contractor
CO	Change Order	Engineer
CMR	Contract Modification Request	Contractor
CTR	Certified Test Report	Contractor
EIR	Equipment Installation Report	Contractor
FO	Field Order	Engineer
NBC	Notification by Contractor	Contractor
O&M	Operation & Maintenance Manuals	Contractor
PD	Photographic Documentation	Contractor
RD	Record Data	Contractor
RFI	Request for Information	Contractor
SAM	Sample	Contractor
SD	Shop Drawing	Contractor
SCH	Schedule of Progress	Contractor

2. Issue sequence numbers in chronological order for each type of submittal.
3. Issue numbers for resubmittals that have the same number as the original submittal followed by an alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: SD 025 A represents shop drawing number 25 and the letter "A" designates this is the second time this submittal has been sent for review.
4. Clearly note the submittal number on each page or sheet of the submittal.
5. Correct assignment of numbers is essential since different submittal types are processed in different ways.

- D. Submit documents with uniform markings.
 - 1. Mark submittals to:
 - a. Highlight Contractor's corrections in green.
 - b. Highlight items pertinent to the products being furnished in yellow and delete items that are not when the Supplier's standard drawings or information sheets are provided.
 - c. Cloud items and highlight in yellow where selections by the Engineer or Owner are required.
 - d. Mark dimensions with the prefix FD to indicate field verified dimensions on the Shop Drawings.
 - e. Provide an 8-by-3-inch blank space for Contractor's and Engineer's stamp. Contractor may use a digital certification if this is preferred. The certification must bear a digital signature.
 - 2. Define abbreviations and symbols used in Shop Drawings.
 - a. Use terms and symbols in Shop Drawings consistent with the Contract Drawings.
 - b. Provide a list of abbreviations and their meaning as used in the Shop Drawings.
 - c. Provide a legend for symbols used on Shop Drawings.
- E. Mark submittals to reference the Drawing number and/or section of the Specifications, detail designation, schedule or location that corresponds with the data submitted. Other identification may also be required, such as layout drawings or schedules to allow the reviewer to determine where a particular product is to be used.
- F. Deliver Samples required by the Specifications to the Site. Provide a minimum of two Samples.
- G. Construct mock-ups from the actual products to be used in construction per detailed Specifications.
- H. Submit color charts and Samples for every product requiring color, texture or finish selection.
 - 1. Submit all color charts and Samples at one time.
 - 2. Do not submit color charts and Samples until all record data have been submitted or Shop Drawings for the products have been approved.
 - 3. Submit color charts and Samples not less than 30 days prior to when these products are to be ordered or released for fabrication to comply with the schedule for construction of the Project.
- I. Submit Contract Modification Request per the General Conditions to request modifications to the Contract Documents.

1.05 REVIEW PROCEDURES

- A. Shop drawings are reviewed in the order received, unless Contractor request that a different priority be assigned.

- B. Mark a submittal as “Priority” to place the review for this submittal ahead of submittals previously delivered. Priority submittals will be reviewed before other submittals for this Project which have been received but not reviewed. Use discretion in the use of “Priority” submittals as this may delay the review of submittals previously submitted. Revise the Schedule of Contractor’s Submittals for substantial deviations from the previous schedule.
- C. Review procedures vary with the type of submittal as described in Paragraph 1.06.

1.06 SUBMITTAL REQUIREMENTS

- A. Shop Drawings are required for those products that cannot adequately be described in the Contract Documents to allow fabrication, erection or installation of the product without additional detailed information from the Supplier.
 - 1. Shop Drawings are requested so that the Engineer can:
 - a. Assist the Owner in selecting colors, textures or other aesthetic features.
 - b. Compare the proposed features of the product with the specified features so as to advise the Owner that the product does, in general, conform to the Contract Documents.
 - c. Compare the performance features of the proposed product with those specified so as to advise the Owner that it appears that the product will meet the designed performance criteria.
 - d. Review required certifications, guarantees, warranties, and service agreements for compliance with the Contract Documents.
 - 2. Certify on the Contractor’s stamp that the Contractor has reviewed the Shop Drawings and made all necessary corrections such that the products, when installed, will be in full compliance with the Contract Documents. Shop Drawings submitted without this certification will be returned without review.
 - 3. Submit Shop Drawings for:
 - a. Products indicated in the submittal schedule following this section.
 - b. When a substitution or equal product is proposed in accordance with Paragraph 1.08 of this Section.
 - 4. Include a complete description of the material or equipment to be furnished. Information is to include:
 - a. Type, dimensions, size, arrangement, model number, and operational parameters of the components.
 - b. Weights, gauges, materials of construction, external connections, anchors, and supports required.
 - c. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components.
 - d. All applicable standards such as ASTM or Federal specification numbers.
 - e. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings.

- f. Wiring and piping diagrams and related controls.
 - g. Mix designs for concrete, asphalt, or other materials proportioned for the Project.
 - h. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the submittal that the measurements represent actual dimensions obtained at the Site.
5. Provide all required statements of certification, guarantees, extended service agreements, and other related documents with the Shop Drawing. The effective date of these documents shall be the date of acceptance of the Work by the Owner.
 6. Comments will be made on items called to the attention of the Engineer for review and comment. Any marks made by the Engineer do not constitute a blanket review of the submittal or relieve the Contractor from responsibility for errors or deviations from the Contract requirements.
 - a. Submittals that are reviewed will be returned with one or more of the following designations:
 - 1). Approved: Submittal is found to be acceptable as submitted.
 - 2). Approved as Noted: Submittal is acceptable with corrections or notations made by Engineer and may be used as corrected.
 - 3). Revise and Resubmit: Submittal has deviations from the Contract Documents, significant errors, or is inadequate and must be revised and resubmitted for subsequent review.
 - 4). Not Approved: Products are not acceptable.
 - b. Drawings with a significant or substantial number of markings by the Contractor may be marked "Approved as Noted" and "Revise and Resubmit." These drawings are to be revised to provide a clean record of the submittal.
 - c. Dimensions or other data that do not appear to conform to the Contract Documents will be marked as "At Variance With" (AVW) the Contract Documents or other information provided. The Contractor is to make revisions as appropriate to comply with Contract Documents.
- B. Certifications, Warranties and Service Agreements include documents as specified in the Specifications, as shown in the submittal schedule or as follows:
1. Certified Test Reports (CTR): A report prepared by an approved testing agency giving results of tests performed on products to indicate their compliance with the Specifications (refer to NCTCOG Public Works Construction Standards, 4th Edition).
 2. Certification of Local Field Service (CLS): A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300 mile radius of the Site. List names, addresses, and telephone numbers of approved service organizations on or attach it to the certificate.
 3. Extended Warranty (EW): A guarantee of performance for the product or system beyond the normal 1 year warranty described in the General Conditions. Issue the warranty certificate in the name of the Owner.

4. Extended Service Agreement (ESA): A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond the warranty period. Issue the service agreement in the name of the Owner.
 5. Certification of Adequacy of Design (CAD): A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
 6. Certification of Applicator/Subcontractor (CSQ): A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.
- C. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the Project and allow replacement or repair at some future date.
1. Provide record data for all products per the submittal schedule. Record data is not required for items for which Shop Drawings and/or operations and maintenance manuals are required.
 2. Provide information only on the specified products. Submit a Contract Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting record data.
 3. Provide the same information required for Shop Drawings.
 4. Record data will be received by the Engineer, logged, and provided to Owner for the Project record.
 - a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
 - b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.
- D. Provide Samples for comparison with products delivered to the Site for use on the Project.
1. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product, with integrally related parts and attachment devices.
 2. Indicate the full range of color, texture, and patterns.
 3. Dispose of Samples when related Work has been completed and approved, and disposal is requested by the Engineer. At Owner's option Samples will become the property of the Owner.
- E. Construct mock-ups for comparison with the Work being performed.
1. Construct mock-ups of the size or area indicated in the detailed Specifications.
 2. Construct mock-ups complete with texture and finish to represent the finished product.
 3. Protect mock-ups until Work has been completed and accepted by the Owner.

4. Dispose of mock-ups when related Work has been completed and disposal is approved by the Engineer.
- F. Submit Operation and Maintenance manuals (O&M) for all equipment, mechanical devices, or components described in the Contract Documents as required by the Owner. Include copies of approved Shop Drawings in the manual.
- G. Submit Request for Information (RFI) in accordance with the requirements of the Owner.
- H. Submit a Schedule of Values and Application for Payment (AP) in accordance with the requirements of the Owner.
- I. Submit Progress Schedules (SCH) in accordance with the requirements of the Owner.
- J. Submit Certified Test Reports (CTR) from independent testing laboratories in accordance with the requirements of the Owner.
 1. Submit test reports for material fabricated for this Project with Shop Drawings for that product.
 2. Submit test reports produced at the point of production for standard production products with the record data for that product.
- K. Submit a list of Suppliers and Subcontractors as record data. Submit Notifications by Contractor (NBC) in accordance with the requirements of the Owner. Submit Photographic Documentation (PD) in accordance with the requirements of the Owner.

1.07 SUBMITTALS REQUIRED FOR THIS PROJECT

- A. Furnish the following Submittals:
 1. Products as indicated in Section 01 33 00.01 "Table of Required Submittals."
 2. When a substitution or equal product is proposed in accordance with Paragraph 1.08 of this Section.

1.08 REQUESTS FOR DEVIATION

- A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the Contract Documents.
- B. Submit request by Contract Modification Request (CMR) per the General Conditions. Identify the deviations and the reason the change is requested.
- C. Include the amount of cost savings to the Owner for deviations that result in a reduction in cost.
- D. A Change Order or Field Order will be issued by the Engineer for deviations approved by the Owner. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

1.09 SUBMITTALS FOR EQUAL NON SPECIFIED PRODUCTS

- A. The products of the listed suppliers are to be furnished where Specifications list several manufacturers but do not specifically list "or equal" or "or approved equal" products. Use

of any products other than those specifically listed is a substitution and must be approved per Paragraph 1.10.

- B. Contractor may submit other manufacturers' products that are in full compliance with the specification where Specifications list one or more manufacturers followed by the phase "or equal" or "or approved equal."
 - 1. Submit Shop Drawings of adequate detail to document that the proposed product is equal or superior to the specified product.
 - 2. Prove that the product is equal. It is not the Engineer's responsibility to prove the product is not equal.
 - a. Indicate on a point by point basis for each specified feature that the product is equal to the Contract Document requirements.
 - b. Make a direct comparison with the specified manufacturer's published data sheets and available information. Provide this printed material with the submittal.
 - c. The decision of the Engineer regarding the acceptability of the proposed product is final.
 - 3. Provide a typewritten certification that, in furnishing the proposed product as an equal, the Contractor:
 - a. Has thoroughly examined the proposed product and has determined that it is equal or superior in all respects to the product specified.
 - b. Has determined that the product will perform in the same manner and result in the same process as the specified product.
 - c. Will provide the same warranties and/or bonds as for the product specified.
 - d. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the product into the construction and will waive all claims for additional Work which may be necessary to incorporate the product into the Project which may subsequently become apparent.
 - e. Will maintain the same time schedule as for the specified product.
 - 4. A modification request is not required for any product that is in full compliance with the Contract Documents.

1.10 SUBMITTALS FOR SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide for the Project in lieu of the specified product.
- B. Submit the following for consideration of approval of a Supplier or product which is not specified:
 - 1. Contract Modification Request for deviation from the Contract Documents per Paragraph 1.07.
 - 2. Prove that the product is acceptable as a substitute. It is not the Engineer's responsibility to prove the product is not acceptable as a substitute.

- a. Indicate on a point by point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
 - b. Make a direct comparison with the specified Suppliers published data sheets and available information. Provide this printed material with the submittal.
 - c. The decision of the Engineer regarding the acceptability of the proposed substitute product is final.
3. Provide a written certification that, in making the substitution request, the Contractor:
- a. Has determined that the substituted product will perform in substantially the same manner and result in the same ability to meet the specified performance as the specified product.
 - b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
 - c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the Project and will waive all claims for additional Work which may be necessary to incorporate the substituted product into the Project which may subsequently become apparent.
 - d. Will maintain the same time schedule as for the specified product.
- C. Pay engineering cost for review of substitutions.
- 1. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of Shop Drawings by Engineer and in accordance with the rates listed in the Contract Documents.
 - 2. Cost for the additional review shall be paid to the Owner by the Contractor on a monthly basis.

1.11 WARRANTIES AND GUARANTEES

- A. Submit warranties and guarantees required by the Contract Documents with the Shop Drawings or record data.
- B. Provide additional copies for equipment and include this additional copy in the Operation and Maintenance Manuals.
- C. Provide a separate manual for warranties and guarantees.
 - 1. Provide a log of all products for which warranties or guarantees are provided, and for all equipment. Index the log by Specification section number on forms provided by the Engineer.
 - 2. Indicate the start date, warranty or guarantee period and the date upon which the warranty or guarantee expires for products or equipment for which a warranty or guarantee is required.
 - 3. Indicate the date for the start of the correction period specified in the General Conditions for each piece of equipment and the date on which the specified correction period expires.
 - 4. Provide a copy of the warranty or guarantee under a tab indexed to the log.

1.12 RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. For Shop Drawings:
 - 1. Revise initial drawings or data and resubmit as specified for the original submittal.
 - 2. Highlight in yellow those revisions which have been made in response to the first review by the Engineer.
 - 3. Highlight in blue any new revisions which have been made or additional details of information that has been added since the previous review by the Engineer.
- C. For Samples:
 - 1. Submit new Samples as required for the initial Sample.
 - 2. Remove Samples which have been rejected.
- D. For mock-ups:
 - 1. Construct a new mock-up as initially required.
 - 2. Dispose of mock-ups which have been rejected.
- E. Pay for excessive review of Shop Drawings.
 - 1. Excessive review of Shop Drawings is defined as any review required after the original review has been made and the first resubmittal has been checked to see that corrections have been made.
 - 2. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of Shop Drawings by Engineer and in accordance with the rates listed in the Contract Documents.
 - 3. Pay cost for the additional review to the Owner on a monthly basis as billed by the Owner.
 - 4. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals, will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

1.13 ENGINEER'S DUTIES

- A. Review the submittals and return with reasonable promptness.
- B. Affix stamp, indicate approval, rejection, and the need for resubmittal.
- C. Distribute documents.

END OF SECTION

01 33 00.01 TABLE OF REQUIRED SUBMITTALS

1.00 GENERAL

1.01 REQUIRED SUBMITTALS

- A. The following tabulation list the submittals required for each Submittal Section. Each Specification section may provide more detailed information regarding the data to be provided for each product, materials, equipment or component required by the specification. Provide additional documentation as required by the Contract Documents in accordance with Section 01 33 00 "Submittal Procedures" and each Specification section and as reasonably requested by the Owner, Construction Manager and Engineer.
- B. Incorporate each submittal in the Construction Schedule and Indicate the date each submittal is anticipated to be submitted.

SUBMITTAL SCHEDULE													
Spec Number	Description	Shop Drawing	Sample	Certified Test Report	Certification of Local Field Service	Extended Warranty	Extended Service Agreement	Certificate of Adequacy of Design	Certification of Applicator/Subcontractor	Record Data	Operation and Maintenance Manuals	Equipment Installation Report	Process Performance Bond
03 11 00	Concrete Forming									x			
03 21 00	Reinforcing Steel	x		X						X			
03 30 00	Cast-In-Place Concrete	X		X									
09 96 00	High-Performance Coatings	X	X							X			
26 56 19	Luminaire Pole	X								X			
26 56 20	Luminaire Fixture	X								X			
31 05 13	Soils for Earthwork												
31 05 16	Aggregates for Earthwork			X									
31 23 16	Unclassified Street Excavation												
31 23 23	Select Fill												
31 23 23.34	Flowable Fill			X									
31 24 13	Embankment												
31 25 00	Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control									X			
32 11 13	Lime Treatment			X									

SUBMITTAL SCHEDULE													
Spec Number	Description	Shop Drawing	Sample	Certified Test Report	Certification of Local Field Service	Extended Warranty	Extended Service Agreement	Certificate of Adequacy of Design	Certification of Applicator/Subcontractor	Record Data	Operation and Maintenance Manuals	Equipment Installation Report	Process Performance Bond
32 11 23	Sand Bedding												
32 11 33	Portland Cement Treatment												
32 12 12	Concrete Pavement			X									
32 13 14	Rolling												
32 13 73	Joint Sealant												
32 16 13	Concrete Curb and Gutter												
32 16 50	Reinforced Concrete Sidewalk												
32 16 55	Barrier Free Ramp												
32 16 60	Concrete Median Nose												
32 16 65	Reinforced Concrete Header												
32 17 23	Pavement Markers and Markings	X											
32 17 25	Prefabricated Pavement Marking (with Warranty)	X											
32 84 23	Landscape Irrigation	X						X		X	X		
32 91 13	Fertilizer												
32 91 19	Topsoil												

SUBMITTAL SCHEDULE													
Spec Number	Description	Shop Drawing	Sample	Certified Test Report	Certification of Local Field Service	Extended Warranty	Extended Service Agreement	Certificate of Adequacy of Design	Certification of Applicator/Subcontractor	Record Data	Operation and Maintenance Manuals	Equipment Installation Report	Process Performance Bond
32 92 23	Turfgrass Planting		X							X			
32 93 00	Tree, Shrub, and Groundcover Planting		X										
32 92 00	Removal, Protection and Replacement of Trees, Shrubbery, Plants, Sod, and Other vegetation												
33 05 10	Trenching, Backfilling and Compaction			X				X					
33 05 23	Trenchless Utility Installation	X		X				X		X			
33 05 23.13	Utility Horizontal Directional Drilling	X								X			
33 11 14	PVC Pipe for Water Distribution (Force Main)	X		X									
33 12 16	Air Valves for Portable Water systems and Wastewater Force Mains	X						X			X		
33 12 16.19	Eccentric Plug Valves	X									X		
33 12 17	Resilient Seated Gate Valves	X											
33 12 40	Polyethylene Encasement	X											
33 12 60	Mechanical Restraint for PVC and Ductile Iron Pipe	X											
33 39 13	Wastewater Manhole Frames and Covers	X								X			
33 39 15	Precast Concrete Manholes	X		X									

SUBMITTAL SCHEDULE													
Spec Number	Description	Shop Drawing	Sample	Certified Test Report	Certification of Local Field Service	Extended Warranty	Extended Service Agreement	Certificate of Adequacy of Design	Certification of Applicator/Subcontractor	Record Data	Operation and Maintenance Manuals	Equipment Installation Report	Process Performance Bond
34 41 13	Installation of Highway Traffic Signal	X											
34 41 25	Vehicle and Pedestrian Signal Heads	X											
34 41 30	Traffic Signal Cable												
34 41 35	Ground Box												
34 41 50	Small roadside Sign Supports and Assemblies												
34 71 13	Barricades, Signs, and Traffic Handling								X				

END OF SECTION

SECTION 015813

PROJECT SIGN

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish, install, and maintain Project Sign.

1.02 REFERENCES

- A. City of Frisco Standard Detail for Project Sign.

PART 2 - PRODUCTS

- A. Contractor may contact Southwest Signs & Graphics, Frisco, Texas at (972) 335-0234 or other City approved manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractor shall coordinate with the City regarding the location prior to installation. The City shall provide on-site inspection of the installation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item will be measured on a per Each (EA) basis.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item and measured as provided under MEASUREMENT will be paid for at the unit bid price for "Project Sign" in accordance with the City of Frisco's Standard Detail for Project Sign. This price is full compensation for all material, labor, equipment, tools and superintendence necessary to furnish and install Project Sign.

END OF SECTION

Section 017001

Radio Frequency Identification (RFID) Markers

Part 1-GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install RFID marker technology in near surface, ball and full range variations buried above key underground elements during construction and maintenance.

1.02 REFERENCES

- A. Markers are available in seven standard frequencies, color coded to American Public Works Association (APWA) standards to quickly signify the application.
- B. See plans for marker locations at: http://solutions.3m.com/wps/portal/3M/en_US/Locating-Marking-NA/Home/Resource-Directory/Manuals-Documentation/

PART 2-PRODUCTS

2.01 MATERIALS

- A. The receiver\transmitter (locator):
The Locator shall have the capability to write template data into the markers, locate the electronic markers, read the template data from the electronic markers and be able to transmit data back to PC. The necessary software shall be included with each electronic marker locator. The electronic marker locator shall have 6 frequencies with a 12 Watt transmitter. If specified in special conditions, the locator will be relinquished to the City of Frisco as their property upon completion of the project.
- B. RFID Markers: Ball Marker, Near Surface or Full Range shall be installed depending on depth of facility
 - a. RFID Marker Telecommunications (orange) , 101.4khz shall be used for copper and fiber optic cable systems that connect to the telephone facilities
 - b. RFID Marker Power (red), 169.8khz shall be used for all electrical power systems
 - c. RFID Marker Water (blue), 145.7khz shall be used for all water mains and services
 - d. RFID Marker Wastewater (green), 121.6khz shall be used for all mains and services
 - e. RFID Marker Gas (yellow), 83khz shall be used for natural gas and liquefied petroleum mains and services
 - f. RFID Marker Cable TV and communications (black/orange), 77khz shall be used for copper and fiber optic cable systems that are independent of the telephone system
 - g. RFID Marker General purpose and reclaimed water (purple), 66.35khz shall be used to identify abandoned facilities and signs as well as other underground and/or above ground facilities that are to be mapped or inventoried

Part 3-EXECUTION

3.01 Training

- A. Training on programming RFID markers must be completed by contractor and/or consultant and documentation of training must be obtained and provided to the City of Frisco.
- B. Installation
 - a. Refer to manufacturer's installation procedures. Contractor shall test each RFID Marker prior to installation to insure signals are received and transmitted.

- b. The contractor shall be responsible for placing the appropriately colored RFI Markers where indicated on the plans. Additional Markers may be required by the engineer at locations where:
 - 1. The utility line changes direction through an angle, bend or tee
 - 2. On tangents where the length between the points where the utility changes direction exceeds 200 Feet. Where this condition is present, additional markers shall be placed on the utility line at equal intervals not to exceed 200 feet.
 - 3. On horizontal curves having a radius greater than 100 feet, additional markers shall be placed on the utility line at the Point of Curvature (PC) and Point of Tangency (PT) and at points between the PC and PT at equal intervals not to exceed 100 feet.
 - 4. Points of crossing with other utilities. In these instances, the type of Marker used shall be consistent with the utility being placed and the utility being crossed will be noted in the data set number
 - 5. Significant underground utility structures affecting the network are placed, such as pipe reducers, termination points
- c. Markers shall be installed by the contractor directly above the subject utility in accordance with the manufacturer's installation recommendations.
 - 1. The bury depth of the ball markers shall be no greater than five feet and no less than two feet below finish grade.
 - 2. The bury depth of the near surface markers shall be no greater than 2.5 feet and no less than 12 inches.
 - 3. The bury depth of the full range marker shall be no greater than 8 feet and no less than 4 feet below grade.
- d. The contractor shall establish the GPS coordinates for placement of markers and input the coordinates to the spreadsheet to be furnished to the city upon the completion of the project. GPS coordinates can be obtained from a hand-held GPS device – additional survey is not required for this item. Accuracy of horizontal locations must be within one square foot.
- e. Ball Markers shall be placed at least four inches above the utility and at least six inches above any metallic utilities.
- f. Contractor shall hand fill at least six inches of soil over the Ball Marker and compact soil around the marker using means and methods recommended by the manufacturer.
 - 1. Contractor shall program each of the RFI Markers as they are installed using the appropriate electronic marker locating device.
- g. Contractor shall test and program each marker after the installation\projects are complete. In the event that a marker is damaged during the installation process and/or a signal from the marker cannot be obtained, the contractor shall replace the marker with a functional marker at no additional cost.
- h. The contractor shall compile and maintain a spreadsheet of the data stored on the markers and include the GPS coordinates to the spreadsheet. Upon completion of the project contractor shall provide the spreadsheet to the City of Frisco.
- i. The following input (2-7) shall be programmed onto each marker by the contractor:
 - 1. Marker Identification number = ***“Indicate 10 digit number”***
This number will self populate once information is downloaded from locator to spreadsheet through PC Dynatel Tools (training required as indicated in 2.01.C)
 - 2. Question 1: Owner
 - 3. Question 2: Description
 - 4. Question 3: Status
 - 5. Question 4: Material

6. Question 5: Size
 7. Question 6: Depth from marker to pipe
- j. GPS Coordinates must be documented during installation and manually entered into spreadsheet that will be provided to the City of Frisco upon completion of the project.

Part 4: MEASUREMENT AND PAYMENT

4.01.1 Measurement

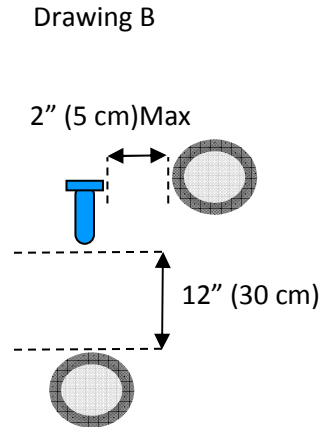
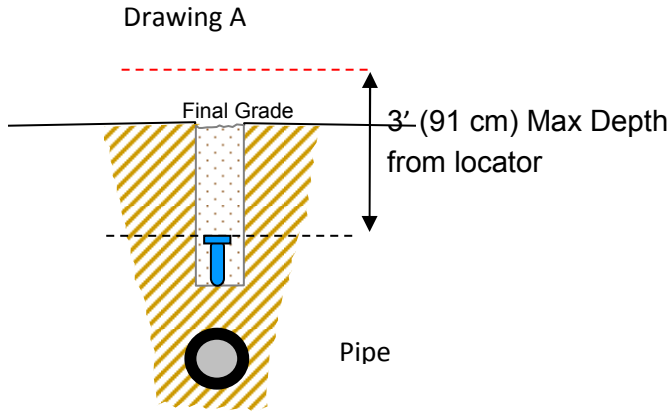
- A. This Item shall be measured on a per Each (EA) basis for each RFID marker, complete in place

4.01.2 Payment

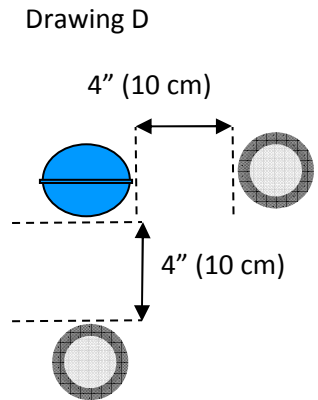
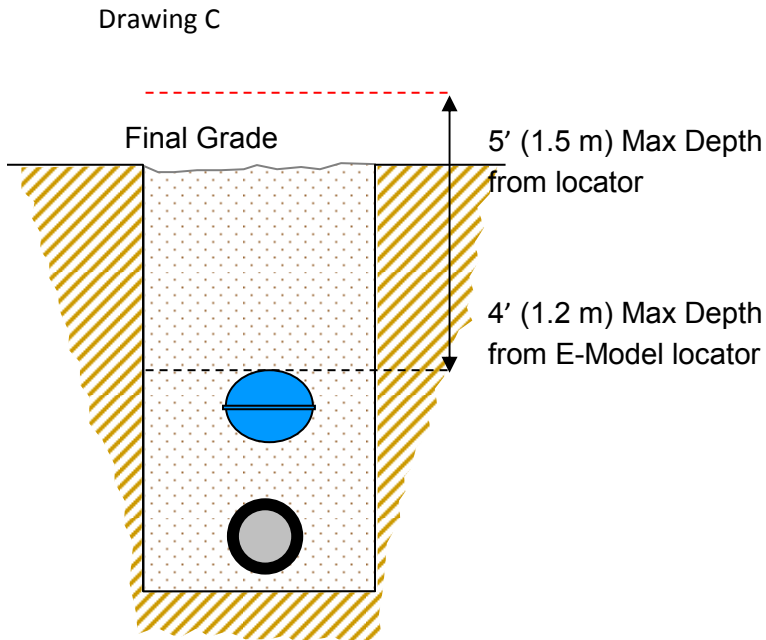
- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for “RFID Marker,” of the type specified. This price is full compensation for all material, labor, equipment, instrumentation, training, data documentation, tools and superintendence necessary to complete the work, including installing the RFID Markers and providing the spreadsheet.

RFID MARKER INSTALLATION DETAILS

NEAR SURFACE MARKER

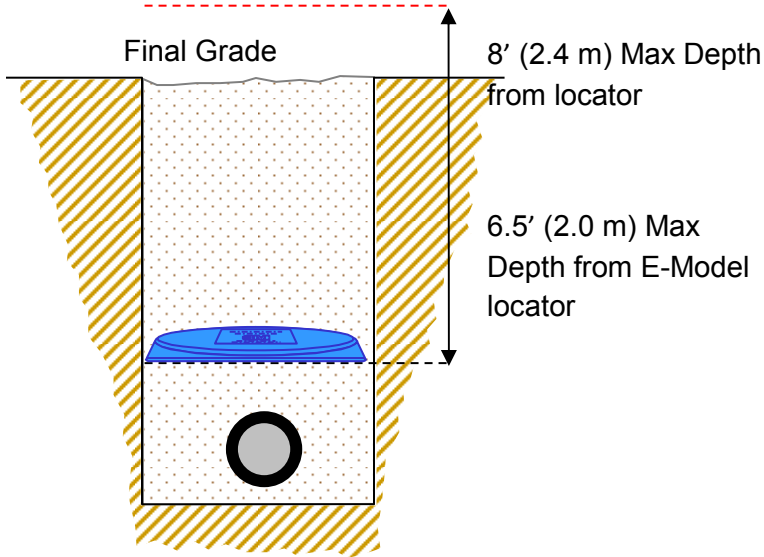


BALL MARKER

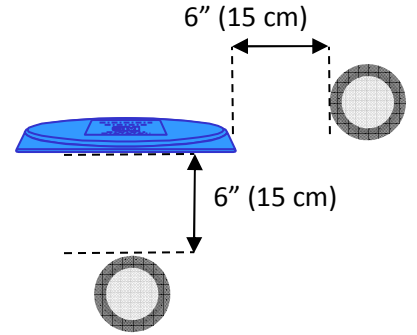


FULL RANGE MARKER

Drawing E



Drawing F



END OF SECTION

SECTION 017113**MOBILIZATION****PART 1 - GENERAL**

1.01 DESCRIPTION

The work under this section of the specification shall include the establishment of offices and other facilities on the project site and the movement of personnel, construction equipment, and supplies to the project site or to the vicinity of the project site to enable the Contractor to begin work on the other contract items that will be performed by the Contractor. This Item also includes all costs associated with bonding and insurance.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item will be measured on a Lump Sum (LS) basis as the work progresses.
- B. The maximum bid amount for this Item shall be 5% of the total amount bid for the project.

4.02 PAYMENT

Partial payments of the bid for Mobilization will be as follows. The adjusted contract amount for construction items as used below is defined as the total contract amount less the bid for Mobilization.

- A. When 1% of the adjusted contract amount for construction items is earned, 50% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount.
- B. When 5% of the adjusted contract amount for construction items is earned, 75% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount.
- C. When 10% of the adjusted contract amount for construction items is earned, 90% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount.
- D. When 50% of the adjusted contract amount for construction items is earned, 100% of the mobilization lump sum bid will be paid. Previous payments under this Item will be deducted from this amount..

END OF SECTION

SECTION 017416

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary for Dust Control in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.8.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.8

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.8.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.8.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall not be measured as a separate contract Item.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

END OF SECTION

DIVISION 02
EXISTING CONDITIONS

SECTION 024100**GENERAL SITE PREPARATION****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All materials, labor, equipment, tools and superintendence necessary for the preparation of the project site not covered elsewhere in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.
- B. This Section also includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing
 - 4. Demolition
 - 5. Removal of all items within the limits of construction not specifically noted to remain.

1.01 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 203.1, 203.2, and 203.3

1.02 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from City and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvaged materials: Carefully remove items indicated to be salvaged and store as directed by the City.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
 - 1. Call DigTESS at 1-800-344-8377
 - 2. Contact City's ROW Division of Public Works at 972-292-5820 for locates
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 – PRODUCTS

Not used

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 203.1, 203.2 and 203.3.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a Lump Sum (LS) basis, unless indicated otherwise and shall include the removal of all items within the limits of construction not specifically called out to remain.
- B. Removal of existing pavement will be measured separately and paid for by the square yard (SY), regardless of thickness and type. Concrete curb and gutter removal will not be measured separately and is considered subsidiary to this item.
- C. Removal of existing sidewalk and ramps will be measured separately and paid for by the square yard (SY), regardless of thickness and type.
- D. Removal of existing inlets, headwalls, manholes, etc. will be measured separately and paid for per each (EA) inlet removed, regardless of the size of the existing inlet. Removal of existing pipe will not be measured separately and is considered subsidiary to this item.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price. This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work.

END OF SECTION

DIVISION 03

CONCRETE

03 11 00 CONCRETE FORMING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish material and labor to form, tie, brace and support wet concrete, reinforcing steel and embedded items until the concrete has developed sufficient strength to remove forms.

1.02 QUALITY ASSURANCE

- A. Design Criteria: Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete, the temperature of the concrete, and all other pertinent factors shall be taken into consideration when determining the depth of the equivalent liquid. An additional design live load of 50 pounds per square foot shall be used on horizontal surfaces.
- B. Alignment Control:
 - 1. True alignment of walls and other vertical surfaces having straight lines or rectangular shapes shall be controlled and checked by the following procedures:
 - a. Forming shall be arranged with provisions for adjusting the horizontal alignment of a form, after the form has been filled with concrete to grade, using wedges, turn buckles, or other adjustment methods. Establish a transit line or other reference so that adjustments can be made to an established line while the concrete in the top of the form is still plastic.
 - b. Adjusting facilities shall be at intervals which permit adjustments to a straight line. Concrete shall not be placed until adequate adjusting facilities are in place.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Record Data.
 - a. Manufacturers' literature for specified products.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:

- 1. American Concrete Institute (ACI) Specifications:

ACI 301	Specifications for Structural Concrete
ACI 318	Building Code Requirements for Structural Concrete

- 2. American Institute of Steel Construction (AISC) Publication:

AISC	Manual of Steel Construction
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- 3. American Iron and Steel Institute (AISI) Publication:

1.05 DELIVERY AND STORAGE

- A. Lumber for forms shall be stacked neatly on platforms raised above ground.

1.06 JOB CONDITIONS

- A. The Contractor shall notify the Engineer upon completion of various portions of the work required for placing concrete so that compliance with the plans and specifications may be monitored. The Engineer will authorize the Contractor to proceed with the placement after this has been completed and corrections, if required, have been made.
- B. In hot weather, both sides of the face forms may be required to be treated with oil to prevent warping and to secure tight joints.

2.00 PRODUCTS

2.01 MATERIALS

- A. Lumber: Properly seasoned and of good quality; free from loose or unsound knots, knot holes, twists, shakes, decay, splits, and other imperfections which would affect its strength or impair the finished surface of the concrete.
- B. Fiber Board Form Lining: Hardboard finished smooth on one side; minimum thickness of 3/16 inch thoroughly wet with water at least 12 hours before using.
- C. Plywood Form Lining: Conforming to APA HDO; exterior exposure waterproof adhesive, 3/8 inch thick.
- D. Form Oil: Light, clear oil; shall not discolor or injuriously affect the concrete surface, subsequent coatings, or delay or impair curing operations.

2.02 FABRICATIONS

- A. Lumber: Lumber for facing or sheathing shall be surfaced on at least one side and two edges, and sized to uniform thickness. Lumber of nominal 1-inch thickness or plywood of 3/4-inch thickness shall be permitted for general use on structures, if backed by a sufficient number of studs and wales.
- B. Forms:
 - 1. Forms shall be built mortar tight and of material sufficient in strength to prevent bulging between supports.
 - 2. Reused forms or form lumber shall be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness, and smoothness of surface.
 - 3. All forms shall be so constructed as to permit removal without damage to the concrete. Exercise special care in framing forms for copings, offsets, railing and ornamental work, so that there will be no damage to the concrete when the forms are removed.
- C. Metal Forms:

1. The specifications for “Forms” regarding design, mortar tightness, filleted corners, beveled projections, bracing, alignment, removal, re use, oiling, and wetting shall apply equally to metal forms.
2. The metal used for forms shall be of such thickness that the forms will remain true to shape. Bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete.
3. Metal forms which do not present a smooth surface or line up properly shall not be used. Exercise special care to keep metal free from rust, grease, or other foreign material that discolors the concrete.

D. Form Ties:

1. Metal form ties shall be used to hold forms in place and to provide easy metal removal. The use of wire for ties shall not be permitted.
2. Leave no metal or other material within 1-1/2 inches of the surface, when removing form tie assemblies which are used inside the forms to hold the forms in correct alignment. The assembly shall provide cone-shaped depressions in the concrete surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching. Such devices, when removed, shall leave a smooth depression in the concrete surface without undue injury to the surface from chipping or spalling.
3. Burning off rods, bolts, or ties shall not be permitted.
4. Metal ties shall be held in place by devices attached to wales. Each device shall be capable of developing the strength of the tie.
5. Metal and wooden spreaders which are separate from the forms shall be wired to top of form and shall be entirely removed as the concrete is placed.
6. In the construction of basement or water bearing walls, the portion of a single rod tie that is to remain in the concrete shall be provided with a tightly fitted washer at midpoint to control seepage. Multi-rod ties do not require washers. The use of form ties which are tapered or encased in paper or other material to allow the removal of complete tie, and which leave a hole through the concrete structure, shall not be permitted.

E. Falsework:

1. Falsework shall be designed and constructed so that no excessive settlement or deformation occurs. Falsework shall provide necessary rigidity.
2. Timber used in falsework centering shall be sound, in good condition and free from defects which impair its strength.
3. Steel members shall be of adequate strength and shape for the intended purpose.
4. Timber piling used in falsework may be of any wood species which satisfactorily withstands driving and which adequately supports the superimposed load.
5. When sills or timber grillages are used to support falsework columns, unless founded on solid rock, shale or other hard materials, place them in excavated pits. Backfill to prevent the softening of the supporting material from form drip or from rains that may

occur during the construction process. Sills or grillages shall be of ample size to support the superimposed load without settlement.

6. Falsework not founded on a satisfactory spread footing shall be supported on piling, which shall be driven to a bearing capacity to support the superimposed load without settlement.

3.00 EXECUTION

3.01 PREPARATION

- A. Before placing concrete, insure that embedded items are correctly, firmly and securely fastened into place. Embedded items shall be thoroughly clean and free of oil and other foreign material. Anchor bolts shall be set to the correct location, alignment and elevation by the use of suitable anchor bolt templates.

3.02 INSTALLATION

A. Pre-Placement:

1. During the elapsed time between building the forms and placing the concrete, maintain the forms to eliminate warping and shrinking.
2. Treat the facing of forms with suitable form oil before concrete is placed. Apply oil before the reinforcement is placed. Wet form surfaces which will come in contact with the concrete immediately before the concrete is placed.
3. At the time of placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust, and other extraneous matter at the time. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of foreign matter during concrete placement.

B. Placement:

1. Set and maintain forms to the lines designated, until the concrete is sufficiently hardened to permit form removal. If, at any stage of the work, the forms show signs of bulging or sagging, immediately remove that portion of the concrete causing this condition. If necessary, reset the forms and securely brace against further movement.
2. Provide adequate cleanout openings where access to the bottom of the forms is not otherwise readily attainable.
3. Carefully and accurately place and support reinforcement in concrete structures.

- C. Removal: Remove forms so that the underlying concrete surface is not marred or damaged in any way. Forms shall not be removed until the concrete has attained sufficient strength to safely carry the dead load, but in no case less than the number of curing days set forth in the following table:

Forms for concrete of minor structural load carrying importance	1 day
Forms for walls, columns, sides of drilled shafts, massive structural components and other members not resisting a bending moment during curing	1 day

Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans \leq 10 feet)	7 days
Forms and falsework under slabs, beams and girders where deflections due to dead load moment may exist (for spans $>$ 10 feet and \leq 20 feet)	14 days

END OF SECTION

SECTION 032100

REINFORCING STEEL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Reinforcing Steel in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2.9.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2.9 and 303.2.11.

1.03 RELATED SECTIONS

- A. Section 321313 – Concrete Pavement

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2.9 and 303.2.11.
- B. Specified reinforcing steel (#4 bars and larger) shall conform to the requirements of ASTM A615, Grade 60.
- C. Grade 40 reinforcing steel (#3 bars) will only be allowed in sidewalks or with approval of the Director of Engineering Services.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2.9 and 303.2.11.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item will not be measured separately.

4.02 PAYMENT

- A. This Item will not be paid separately, but considered subsidiary to pertinent Items.

END OF SECTION

03 30 00 CAST-IN-PLACE CONCRETE

1.00 GENERAL

1.01 SUMMARY

- A. Furnish labor, materials, mixing and transporting equipment and incidentals necessary to proportion, mix, transport, place, consolidate, finish and cure concrete in the structure.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Shop Drawings for:
 - a. Mix design: For each concrete mix, complete the form "Concrete Mix Design" and one of the following forms: "Documentation of Required Average Strength – Field Strength Test Record" or "Documentation of Average Strength – Trial Mixtures."
 - b. Submit a schedule to the Owner's representative which shows the sequence of concrete placements.
 - 2. Certified Test Reports for:
 - a. Materials used in the trial mix design.
 - b. Aggregate, conforming to ASTM C33, including the test reports for soundness and abrasion resistance.
 - c. Aggregate:
 - 1). Verification that aggregate is not "potentially reactive" per ASTM C289.
 - 2). Or a cement chemical analysis indicating that the total alkali content is acceptable per Paragraph 2.02.A.
 - d. 7-day and 28-day compressive strength tests results.
 - 1). When more than 15, 28-day compressive tests results are available from the current Project for a given class of concrete, include the 15-test running average compressive strength versus the required average compressive strength (based on the previous 15 tests) in graphical form.
 - 3. Record Data for:
 - a. Manufacturer's literature on specified materials.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications:
 - 1. A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
- C. Testing Agency Qualifications:
 - 1. An independent testing agency, acceptable to authorities having jurisdiction and the Engineer, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cement in bulk or bags which are plainly marked with the brand and manufacturer's name. Immediately upon receipt, store cement in a dry, weather-tight and properly ventilated structure which excludes moisture. Storage facilities shall permit easy access for inspection and identification. Cement not stored in accordance with the requirements shall not be used.
- B. Sufficient cement shall be in storage to complete placement of concrete started. In order that cement may not become unduly aged after delivery, maintain records of delivery dates. Use cement which has been stored at the Site for 60 days or more before using cement of lesser age. No cement shall be used which is lumped, caked, stored more than 90 days, or whose temperature exceeds 170 F.

1.06 STANDARDS

- A. Mixing, sampling, placing, curing and testing of concrete, and the materials used shall be in compliance with the latest revisions of the following standards, unless otherwise noted in the Contract Documents. The Contractor shall maintain one copy of each of the applicable standards at the construction field office.
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM C31	Standard Practice for of Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Specification Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Specification Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C87	Standard Specification Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C94	Standard Specification of Ready Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C125	Terminology Relating to Concrete and Concrete Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C156	Standard Test Method for Water Retention by Concrete Curing Materials
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C191	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C289	Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C293	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
ASTM C309	Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C579	Standard Test Methods for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C580	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C806	Standard Test Method for Restrained Expansion of Expansive Cement Mortar
ASTM C827	Standard Test Method for Change in Height at Early Stages of Cylindrical Specimens of Cementitious Mixtures
ASTM C845	Standard Specification for Expansive Hydraulic Cement
ASTM C878	Standard Test Method for Restrained Expansion of Shrinkage Compensating Concrete

ASTM C881	Standard Specification for Epoxy Resin Base Bonding Systems for Concrete
ASTM C1240	Standard Specification for Silica Fume used in Cementitious Mixtures
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D746	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D994	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2240	Standard Test Method for Rubber Property Durometer Hardness
ASTM D6690-07	Standard Specification for Joint and Crack Sealant, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96	Standard Test Methods for Water Vapor Transmission of Materials

2. American Concrete Institute (ACI) Standards:

ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavy-weight, and Mass Concrete
ACI 214	Recommended Practice for Evaluation of Strength Test Results
ACI 223	Standard Practice for Use of Shrinkage Compensating Concrete
ACI 301	Specification for Structural Concrete for Buildings
ACI 304	Guide for Measuring, Mixing, Transporting & Placing Concrete
ACI 304.2R	Placing Concrete by Pumping Methods
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308	Standard Practice for Curing Concrete
ACI 309	Guide for Consolidation of Concrete
ACI 318	Building Code Requirements for Reinforced Concrete

3. Corps of Engineers, Department of the Army Specification:

CRD C621 83	Corps of Engineers Specification for Non-Shrink Grout
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4. Federal Specification:

TT S 00227E	Type II, Class A or B, Expansion Joint Sealant
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2.00 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 CONCRETE MATERIALS

- A. Cementitious Material; General: If the fine and/or coarse aggregates test “Potentially Reactive”, in accordance with ASTM C289, then a low alkali cementitious material shall be used. A low alkali cementitious material shall be such that, the total alkali content calculated as the percentage of sodium oxide (Na₂O) plus 0.658 times the percentage of potassium oxide (K₂O) shall not exceed 0.6 percent of the total cementitious material content.
- B. Cement; Type:
 - 1. Type I or I/II Portland cement, conforming to ASTM C150; used for all concrete, unless noted otherwise.
- C. Fly Ash/Pozzolans: Conforming to ASTM C618, Class F
- D. Coarse Aggregate:
 - 1. Crushed stone or gravel conforming to ASTM C33, in the gradation size specified.
 - 2. For gradation size number 467, a maximum aggregate size of 1-1/2 inches is:

Sieve Size	Percent Retained	Percent Passing
2”	0	100
1-1/2”	0-5	95-100
3/4”	30-65	35-70
3/8”	70-90	10-30
No. 4	95-100	0-5

- 3. For gradation size number 57, the maximum aggregate size of 1 inch is:

Sieve Size	Percent Retained	Percent Passing
1-1/2”	0	100

Sieve Size	Percent Retained	Percent Passing
1"	0-5	95-100
1/2"	40-75	25-60
No. 4	90-100	0-10
No. 8	95-100	0-5

4. For gradation size number 67, the maximum aggregate size of 3/4 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/4"	0-10	90-100
3/8"	45-80	20-55
No. 4	90-100	10-10
No. 8	90-100	0-5

5. For gradation size number 8, the maximum aggregate size of 3/8 inch is:

Sieve Size	Percent Retained	Percent Passing
1"	0	100
3/8"	0-15	85-100
No. 4	70-90	10-30
No. 8	90-100	0-10
No. 16	95-100	0-5

E. Fine Aggregate:

1. Washed and screened natural sands or sands manufactured by crushing stones; conforming to ASTM C33. The gradation in ASTM C33 for air entrained concrete is:

Sieve Size	Percent Retained	Percent Passing
3/8"	0	100
#4	0-5	95-100
#8	0-20	80-100
#16	15-50	50-85
#30	40-75	25-60
#50	70-90	10-30

2. Fine aggregate shall have not more than 45 percent retained between any two consecutive sieves. Its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

F. Water: Potable and complying with ASTM C94.

2.03 ADMIXTURES

- A. Air Entraining Admixture: Conforming to ASTM C260.
- B. Water Reducing Admixtures: Conforming to ASTM C494; Types “A” or “D” only; accurately measured and added to the mix according to the manufacturer’s recommendations.
- C. Set Retarding Admixtures: Conforming to ASTM C494; Types “B” and “D” only; accurately measured and added to the mix in according to the manufacturer’s recommendations.
- D. Water Reducing Admixtures - High Range (HRWR): High Range Water Reducer shall comply with ASTM C494, Type F or G. HRWR shall be accurately measured in accordance with the manufacturer’s recommendations. HRWR shall be added to the concrete mix at the concrete batch plant. HRWR may not be added at placement site except to redose a batch and only after approval of the HRWR manufacturer. The high range water reducing admixture shall be able to maintain the plasticity range without significant loss of slump or rise in concrete temperature for 2 hours. Other admixtures may only be used with the HRWR if approved by the HRWR manufacturer. A representative of the HRWR manufacturer shall be present during any large placement, placement of slabs, or during times of unusual circumstance which may require changes to the product formulation.
 - 1. Manufacturers:
 - a. Master Builders, Inc.
 - b. W. R. Grace & Co.
 - c. Sika Corporation.

2.04 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. Unless indicated otherwise, provide the following configurations.
 - 1. Construction Joints:
 - a. Profile: Ribbed without center bulb.
 - b. Width: 6 inches.
 - c. Minimum thickness: 3/8 inch.
- B. Manufacturers:
 - 1. PVC Waterstops:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Murphy: Paul Murphy Plastics Co.
 - d. Progress Unlimited Inc.
 - e. Sternson Group.
 - f. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
 - g. Vinylex Corporation.

h. Westec Barrier Technologies; Div. of Western Textile Products, Inc.

2.05 CURING MATERIALS

- A. Sheet Curing Material: Conforming to ASTM C171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. White burlap - polyethylene film.
- B. Membrane Curing Compounds: Membrane curing compound conforming to ASTM C309; having a color to indicate coverage when applied; non-staining; applied according to the manufacturer's recommendations. No curing compound shall be used on walls which are to receive a plaster mix finish. When tested according to ASTM C156, the curing compound shall provide a film which has retained, within the specimen, the following percentages of moisture present when the curing compound was applied:
 - 1. At least 97 percent at the end 24 hours.
 - 2. At least 95 percent at the end of 3 days.
 - 3. At least 91 percent at the end of 7 days.
- C. Concrete Curing and Sealing Compound:
 - 1. Where a sealer is necessary, use a concrete curing and sealing compound. Application of this product shall be in accordance with the manufacturer's recommendations.
 - 2. Sonneborn Kure 1315, by BASF The Chemical Company.
- D. Finishing Aid: Spraying material designed to form a monomolecular film on fresh concrete that reduces the rate of evaporation of surface moisture prior to finishing; conforming to Confilm, as manufactured by Master Builders, Inc. This material is not a curing compound. Concrete must be cured as specified.

2.06 RELATED MATERIALS

- A. Non-Shrink Grout:
 - 1. General: Non-shrink grout for grouting of pump, motor, and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates, piping block outs and other uses of grout. Grout shall meet the following requirements, as verified by independent laboratory tests:
 - a. No shrinkage from the time of placement, or expansion after set, under ASTM C827 and CRD C621 83 (Corps of Engineers). When non shrink grouts are tested under CRD C621 83, the grout shall be tested in a fluid state. A fluid state shall be defined as flowing through a flow cone at a rate of 20 seconds, plus or minus 5 seconds.
 - b. An initial set time of not less than 45 minutes under ASTM C191.
 - 2. Non Shrink Non Metallic Grout: Pre mixed, non-staining, non-shrink grout; minimum 28-day compressive strength of 5000 psi.
 - a. Do not use for vibrating equipment.

- b. Products:
 - 1). Masterflow 713 Plus by BASF The Chemical Company.
 - 2). Five Star Grout by Five Star Products, Inc.
 - 3). SikaGrout 212 by Sika Corporation.
- B. Normal Shrinkage Grout: 1 part Portland cement, Type I, to 3 parts of clean, first quality sand; proportioning on a volumetric basis; used for non-structural applications for grouting areas as shown on the Drawings which do not require non-shrink grout.
- C. Foundation Waterproofing: Thoroseal Foundation Coating as manufactured by Thoro Systems Products. Foundation coating shall be used only on the exterior of concrete walls not exposed to view where indicated on the Drawings.
- D. Zinc Rich Primer: Aluminum surfaces which contact or are embedded in concrete shall be coated with zinc rich primer. Primer shall be Tneme-Zinc.

2.07 REPAIR MATERIALS

- A. Structural Concrete Repair Material: Non-shrink, non-slump, non-metallic, quick setting patching mortar; as approved by the manufacturer for each application and applied accordance with the manufacturer's recommendations.
 - 1. Products:
 - a. Sikatop 123 by Sika Corporation.
 - b. Five Star Structural Concrete by Five Star Products, Inc.

2.08 CONCRETE MIXTURES

- A. Design Criteria:
 - 1. Provide a mix design for each concrete application indicated. This may necessitate multiple mix designs for each class of concrete depending on HRWR, entrained air, and other requirements.
 - 2. All Concrete shall be normal weight concrete composed of Portland cement, fine aggregate, coarse aggregate, admixtures, and water, as specified.
 - 3. ACI 211.1 shall be the basis for selecting the proportions for concrete made with aggregates of normal and high density and of workability suitable for usual cast in place structures.
 - 4. The workability of any mix shall be as required for the specific placing conditions and the method of placement. The concrete shall have the ability to be worked readily into corners and around reinforcing steel without the segregation of materials or the collection of free water on the surface. Compliance with specified slump limitations shall not necessarily designate a satisfactory mix.
 - 5. In no case shall the amount of coarse material produce harshness in placing or honeycombing in the structure, when forms are removed.
 - 6. The maximum amount of coarse aggregate (dry loose volume) per cubic foot of finished concrete shall not exceed 0.82 cubic feet.

7. In calculating water-cement ratio: The water content shall include the amount of water batched or to be added later, plus the free water in the aggregate, and minus the water content at SSD conditions.
8. No allowance shall be made for the evaporation of water after batching. If additional water is required to obtain the desired slump, a compensating amount of cement shall also be added. In no case shall the maximum water cement ratio exceed the specified maximum or that of the approved mix design.
9. Air Entrainment: Provide the percent air entrainment in each concrete mix design as recommended by ACI 318 and ACI 350 for "Moderate Exposure" (Class F1), unless otherwise specified/restricted:
 - a. Do not provide air-entrainment in drilled shafts unless placed underwater.
 - b. Do not provide air-entrainment and entrapped air shall not exceed 3 percent for the following applications:
 - 1). Interior slabs.
 - 2). Slabs on composite metal decks.
10. When job conditions dictate, water-reducing and set-controlling admixtures may be used. Only specified admixtures shall be used. Admixtures shall be batched at the batch plant.
11. High Range Water Reducer (HRWR): Provide HRWR in mix designs as indicated for specified applications. Slump of concrete with the addition of HRWR may be increased to 8 inches (+/- 1 inch).
 - a. Drilled shafts, footings, walls, columns, and beams.
 - b. Interior of building curbs which are not cast monolithically with slabs.
 - c. Precast concrete.
 - d. Do not provide HRWR in slabs and pavement (a water reducer is permitted provided performance requirements are met).
12. If fly ash is to be used in place of cement, no more than 25 percent of the cement may be replaced.
13. Concrete shall be capable of developing two-thirds of the required 28-day compressive strength in 7 days.

B. Concrete Classifications:

Class	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (inches)	Max. Water: Cement Ratio	Slump +/- 1 (inches)	Min. Sacks of Cement Per Cubic Yard **
A	4000	1.5 Size No. 467	0.45	3 (8*)	5.75
B	3000	1.5 Size No. 467	0.47	3	5.75

Class	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (inches)	Max. Water: Cement Ratio	Slump +/- 1 (inches)	Min. Sacks of Cement Per Cubic Yard **
C	4000	1.0 Size No. 57	0.45	4 (8*)	5.75
D	5000	0.75 Size No. 67	0.47	4	6.00
E	1500	1.5 Size No. 467	0.70	4	4.00
F	4000	0.375 Size No. 8	0.47	3	6.50
* Slump shown is with HRWR					
** Provide one additional sack of cement per cubic yard if concrete must be deposited in standing water.					

C. Concrete Usage:

Class	Usage
Class A Use	Footings and slabs, and other unless noted otherwise
Class B Use	Not Used
Class C Use	Walls, columns, beams, drilled shafts
Class D Use	Not Used
Class E Use	Mud slab, lean concrete backfill
Class F Use	Not Used

D. Required Average Compressive Strength:

1. All concrete is required to have an average compressive strength greater than the specified strength. The required average compressive strength shall be established according to the requirements of ACI 301, 4.2.3.3.
2. Standard Deviation: If the production facility has records of field tests performed within the past 12 months and spanning a period of not less than 60 calendar days for a class of concrete within 1000 psi of that specified for the Work, calculate a standard deviation and establish the required average strength f_{cr}' in accordance with ACI 301, 4.2.3.2 and 4.2.3.3.a. If field test records are not available, select the required average strength from ACI 301, Table 4.2.3.3.b.

E. Documentation of Required Average Compressive Strength:

1. Documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength, shall consist of field strength records or trial mixture.
2. Field Strength Records: Document field strength records according to ACI 301, 4.2.3.4.a and including the following:
 - a. Field test data shall not be older than 1 year.

- b. If field test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 60 days, verify that the average of the field test results equals or exceeds f_{cr}' . Submit for acceptance the mixture proportions along with the field test data.
 - c. If the field test data represent two groups of compressive strength tests for two mixtures, plot the average strength of each group versus the water-cementitious materials ratio of the corresponding mixture proportions and interpolate between them to establish the required mixture proportions for f_{cr}' .
3. Trial Mixtures:
- a. Establish trial mixture proportions according to ACI 301, 4.2.3.4.b and including the following.
 - 1). Make at least three trial mixtures complying with performance and design requirements. Each trial mixture shall have a different cementitious material content. Select water-cementitious materials ratios that will produce a range of compressive strengths encompassing the required average compressive strength f_{cr}' .
 - 2). Submit a plot of a curve showing the relationship between water-cementitious materials ratio and compressive strength.
 - 3). Establish mixture proportions so that the maximum water-cementitious materials ratio is not exceeded when the slump is at the maximum specified.
 - b. Laboratory Samples shall be taken in accordance with the trial mix designs for laboratory testing purposes.
 - c. The fresh concrete shall be tested for Slump (ASTM C143) and Air Content (ASTM C173 and ASTM C231). Strength test specimens shall be made, cured and tested for 7-day and 28-day strength in accordance with ASTM C192, ASTM C39, and ASTM C293.
 - d. Suitable facilities shall be provided for readily obtaining representative Samples of aggregate from each of the weigh batchers for test purposes and for obtaining representative Samples of concrete for uniformity tests. The necessary platforms, tools, and equipment for obtaining Samples shall be furnished. Aggregates shall be tested in accordance with ASTM C289.
 - e. The cement contents specified are minimum values. If additional quantities are required to obtain the specified strengths, supply the cement at no additional cost to the Owner.
 - f. A trial mix shall be designed by an independent testing laboratory, retained and paid by the Contractor and approved by the Owner. The testing laboratory shall submit verification that the materials and proportions of the trial concrete mix design meet the requirements of the Specifications.
 - g. From these trial mix tests, the ratios between 7-day and 28-day strengths shall be established. The 7-day strength which corresponds to the required 28-day strength shall be determined.

- B. The mixing time for stationary mixers shall be based upon the mixer's ability to produce uniform concrete throughout the batch and from batch to batch. For guidance purposes, the manufacturer's recommendations, or 1 minute for 1 cubic yard plus 1/4 minute for each additional cubic yard may be used. Final mixing time shall be based on mixer performance. Mixers shall not be charged in excess of the capacity specified by the manufacturer.
- C. When a stationary mixer is used for partial mixing of the concrete (shrink mixed), the stationary mixing time may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).
- D. When a truck mixer is used, either for complete mixing (transit-mixed) or to finish the partial mixing in a stationary mixer and in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum, at the rate of rotation designated by the manufacturer of the equipment as mixing speed. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to no less than 50. Additional mixing shall be performed at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing of transit-mixed concrete shall not be permitted until the truck mixer is at the Site of the concrete placement. Truck mixers shall be equipped with accurate revolution counters.
- E. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket to catch any concrete spillage that may occur when the mixer is discharging concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized. The mixing time shall be determined by time required to transfer the concrete between compartments of the drum.
- F. Vehicles used in transporting materials from the batching plant to the paving mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separated and intact, to the mixer. Cement shall be transported from the batching plant to the mixers in separate compartments which are equipped with windproof and rain proof covers.

3.00 EXECUTION

3.01 PREPARATION

- A. Notify the Owner's representative upon completion of various portions of the work required for placing concrete, so that inspection may be made as early as possible. Keep the Owner's representative informed of the anticipated concrete placing schedules.
- B. All items, including lines and grades, forms, waterstops, reinforcing, inserts, piping, electrical, plumbing and the Contractor's concreting materials and equipment shall be in compliance with the Contract Documents before proceeding.
- C. Do not place any concrete until formwork and the placing reinforcement in that unit is complete. Place no concrete before the completion of all adjacent operations which might prove detrimental to the concrete.

- D. Brilliantly light the Site so that all operations are plainly visible when concrete mixing, placing, and finishing, continues after daylight. Whenever possible, concrete finishing shall be completed in daylight hours.
- E. When placing concrete, the forms shall be clean and entirely free from all chips, dirt, sawdust and other extraneous matter. Forms for slab, beam and girder construction shall not have tie wire cuttings, nails, or any other matter which would mar the appearance of the finished construction. Clean forms and keep them free of any foreign matter during concrete placing.
- F. The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the time limits specified shall not be used. Concrete shall not be re-tempered.
- G. Concrete shall not be placed if impending weather conditions would impair the quality of the finished Work.
- H. Unless otherwise provided, the following requirements shall govern the time sequence on which construction operations shall be carried.
 - 1. Forms for walls or columns shall not be erected on concrete footings until the concrete in the footing has cured for at least 2 curing days. Concrete may be placed in a wall or column as soon as the forms and reinforcing steel placements are approved.
 - 2. Steel beams or forms and falsework for superstructures shall not be erected on concrete substructures until the substructure concrete has cured for at least 4 curing days. Falsework required for superstructures shall not be erected until the substructure has cured for 4 curing days, and shall not be removed until the superstructure has cured.

3.02 EMBEDDED ITEMS

- A. Where aluminum anchors, aluminum shapes, or aluminum electrical conduits are embedded in concrete, paint aluminum contact surfaces with zinc rich primer. Allow the paint to thoroughly dry before placing the aluminum in contact with the concrete.

3.03 JOINTS

- A. Expansion Joints and Devices:
 - 1. Workmanship: Exercise careful workmanship in joint construction to separate the concrete sections by an open joint or by the joint materials, and make the joints true to the outline indicated.
 - 2. Expansion Joints: Construct expansion joints and devices to provide expansion and contraction. Construct joints which are to be left open or filled with poured joint material with forms which are adaptable for loosening or early removal. In order to avoid jamming by the expansion action of the concrete and the consequent likelihood of injuring adjacent concrete, remove or loosen these forms as soon as possible after the concrete has initially set. Make provisions for loosening the forms to permit free concrete expansion without requiring full removal.
 - 3. Armored Joints: Carefully construct armored joints to avoid defective anchorage of the steel and porous or honeycombed concrete adjacent to same. Anchor pre-molded

materials to the concrete on one side of the joint with approved adhesive. Anchor so that the material does not fall out of the joint.

B. Construction Joints:

1. Construction joints are formed by placing plastic concrete in direct contact with concrete which has attained its initial set. When concrete is specified as monolithic, the term shall be interpreted as the manner and sequence of concrete placement so that construction joints do not occur.
 - a. Unless noted otherwise, the maximum horizontal spacing of construction joints shall be 40 feet.
 - b. For slabs on grade, the maximum spacing between two construction joints or between a construction joint and a control joint shall be 15 feet, unless noted otherwise.
 2. Additional horizontal and vertical construction joints, when submitted and approved by the Engineer, may have an impact on reinforcing details. Revise reinforcing details to reflect additional joints.
 3. Unless otherwise provided, construction joints shall be square and normal to the forms. Provide bulkheads in the forms for all joints except horizontal joints.
 4. At the proper time, clean horizontal construction joints for receiving the succeeding lift using air water cutting. The surface shall be exposed sound, clean aggregate. The air pressure supply to the jet shall be approximately 100 lb. per square inch, and the water pressure sufficient to bring the water into effective influence of the air pressure. After cutting, wash the surface until there is no trace of cloudiness in the wash water.
 5. In areas where air water cutting cannot be satisfactorily accomplished, or in areas where it is undesirable to disturb the surface of the concrete before it has hardened, prepare the surface for receiving the next lift by wet sand blasting to immediately remove all laitance and unsound concrete prior to placing of the next lift. Thoroughly wash the surface of the concrete after sand blasting to remove all loose material.
 6. Provide construction joints with concrete keyways, reinforcing steel dowels, and waterstops. The method of forming keys in keyed joints shall permit the easy removal of forms without chipping, breaking, or damaging the concrete.
- C. Existing Hardened Concrete:** Where new concrete or grout is to be placed in contact with existing hardened concrete, texture the existing surface by chipping or other means so that an irregular surface having a height variance of not less than 1/4 inch is created. The existing concrete shall then be coated with a bonding agent and new concrete or grout placed.

3.04 WATERSTOPS

- A. PVC Waterstops:** Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work.
1. At formed surfaces, a split form shall be used. The split form shall have a tight fit which prevents misalignment and concrete leakage.

2. The embedded flange of the waterstop must be secured prior to concrete placement. The flange shall be secured at 12 inches on-center by factory installed hog rings or grommets at the outermost rib. Never place nails or screws through the body of the waterstop.
3. All fittings and changes in direction shall be factory fabricated. Only straight butt splices shall be made in the field. Field splices shall be according to the manufacturer's written instructions and as follows:
 - a. Cut adjoining ends square to form matching edges.
 - b. Uniformly melt the ends at 380 F using a thermostatically controlled, Teflon coated splicing iron.
 - c. When a 1/8-inch diameter melt bead develops on each waterstop end, remove the splicing iron and firmly press the two ends together in proper alignment. Hold until the material has fused and cooled. Allow the splice to cool naturally; do not quench.

3.05 CONCRETE PLACEMENT

A. Cold Weather:

1. If air temperature has fallen to, or is expected to fall below 40 F during the protection period (a minimum of 48 hours unless longer time frame is recommended by ACI 306R), then cold weather concreting shall be performed in accordance with ACI 306R.
2. In cases where the temperature drops below 40 F after the concreting operations have been started, sufficient canvas and framework or other type of housing shall be furnished to enclose and protect the structure, in accordance with the requirements of ACI 306R. Sufficient heating apparatus to provide heat shall be supplied, and heating source and protection from combustion gas shall be in accordance with ACI 306R. The concrete shall be protected when placed under all weather conditions. Should concrete placed under such conditions prove unsatisfactory, remove and replace the concrete at no cost to the Owner.
3. When the air temperature is above 30 F:
 - a. The minimum concrete temperature at the time of mixing shall be 60 F unless other requirements of ACI 306R are met, which may allow for a lower mix temperature.
 - b. The minimum concrete temperature at the time of placement and during the protection period shall be 55 F unless other requirements of ACI 306R are met, which may allow for a lower temperature.
4. The means used to heat a concrete mix shall be in accordance with ACI 306R.
5. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to preventing freezing. Calcium chloride is not permitted.

B. Hot Weather:

1. Hot weather is defined as any combination of high air temperature, low relative humidity and wind velocity that impairs the quality of the concrete. Hot weather concreting shall be in accordance with ACI 305R. Concrete shall be placed in the forms

without the addition of any more water than that required by the design (slump). No excess water shall be added on the concrete surface for finishing. Control of initial set of the concrete and extending the time for finishing operations may be accomplished with the use of approved water reducing and set retarding admixture, as specified.

2. Maximum time intervals between the addition of mixing water and/or cement to the batch, and the placing of concrete in the forms shall not exceed the following (excluding HRWR admixture use):

Concrete Temperature	Maximum time From Water Batch to Placement
Non-Agitated Concrete	
Up to 80 F	30 Minutes
Over 80 F	15 Minutes
Agitated Concrete	
Up to 75 F	90 Minutes
75 F to 89 F	60 Minutes

- a. The use of an approved set-retarding admixture will permit the extension of the above time maximums by 30 minutes, for agitated concrete only.
 - b. The use of an approved high range water reducing (HRWR) admixture will allow placement time extensions as determined by the manufacturer.
3. The maximum temperature of concrete shall not exceed 90 F at the time the concrete is placed. The temperatures of the mixing water shall be reduced by the use of chilled water or ice.
 4. The maximum temperature of concrete with high range water reducing admixture shall not exceed 100 F at the time concrete is placed.
 5. Under extreme heat, wind, or humidity conditions, concreting operations may be suspended if the quality of the concrete being placed is not acceptable.

C. Handling and Transporting:

1. Delivery tickets shall be required for each batch and shall be in accordance with ASTM C94, Section 16. Each delivery ticket must show plainly the amount of water, in gallons that can be added to the mixer truck at the Site without exceeding the maximum water cement ratio approved for that mix design. Amount of water added must be in proportion to contents of truck.
2. Arrange and use chutes, troughs, or pipes as aids in placing concrete so that the ingredients of the concrete are not segregated. They shall be steel or steel lined. When steep slopes are necessary, equip the chutes with baffles or make in short lengths that reverse the direction of movement. Extend open troughs and chutes, if necessary, inside the forms or through holes left in the forms. Terminate the ends of these chutes in vertical downspouts.
3. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete by thoroughly flushing with water before and after placement. Discharge water used for flushing away from the concrete in place.

4. Concrete pumping is permitted and shall comply with ACI 304.2R.
 5. Carting or wheeling concrete batches on completed concrete floor slab shall not be permitted until the slab has aged at least 4 curing days. Unless pneumatic tired carts are used, wheel the carts on timber planking so that the loads and impact are distributed over the slab. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.
- D. Depositing:
1. The method and manner of placing shall prevent segregation or separation of the aggregate or the displacement of the reinforcement. Use drop chutes of rubber or metal when necessary. Prevent the spattering of forms or reinforcement bars if the spattered concrete dries or hardens before it is incorporated into the mass.
 2. Fill each part of the forms by directly depositing concrete as near its final position as possible. Work the coarse aggregate back from the face and force the concrete under and around the reinforcement bars without displacing them. Depositing large quantities at one point in the forms, then running or working it along the forms shall not be permitted.
 3. After the concrete has taken initial set, the forms shall not be jarred. No force or load shall be placed upon projecting reinforcement.
 4. Deposit the concrete through vertical drop chutes of rubber or metal of satisfactory size when operations involve placing concrete from above, such as directly into an excavated area, or through the completed forms, particularly in walls, piers, columns, and similar structures. Drop chutes shall be made in sections or provided in several lengths so that the outlet may be adjusted to proper heights during placing.
 5. Except for drilled shafts, concrete shall not be dropped free more than 10 feet when HRWR admixture is used or 5 feet without HRWR. Place in continuous horizontal layers with a depth of from 1 to 3 feet, depending upon the wall thickness. Each layer shall be soft when a new layer is placed upon it. No more than 1 hour shall elapse between the placing of successive concrete layers in any portion of the structures included in continuous placement.
 6. Place required sections in one continuous operation to avoid additional construction joints.
 7. If excessive bleeding causes water to form on the surface of the concrete in tall forms, make the mix dryer to reduce the bleeding. In tall walls, place the concrete to a point about 1 foot below the top of the wall and allow to settle for 1 to 2 hours. Resume and complete concreting before set occurs.
 8. For slopes greater than two percent, start concrete placement at low end and proceed upslope.
- E. Consolidating:
1. Compact each layer of concrete and flush the mortar to the surface of the forms by continuous-working mechanical vibrators. Vibrators which operate by attachment to forms shall not be used. Apply the vibrator to the concrete immediately after deposit. Move vibrator throughout the layer of the newly placed concrete, several inches into

the plastic layer below. Thoroughly work the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms until it is well-compacted.

2. Mechanical vibrators shall not be operated so that they penetrate or disturb previously placed layers which are partially set or hardened. They shall not be used to aid the flow of concrete laterally. The vibration shall be of sufficient duration to completely compact and embed reinforcement and fixtures, but not to an extent causing segregation.
3. Keep vibrators constantly moving in the concrete and apply vertically at points uniformly spaced, not farther apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location longer than required to produce a liquified appearance on the surface.
4. When submerged in concrete, internal vibrators shall maintain a frequency of not less than 6000 impulses per minute for spuds with diameters greater than 5 inches and 10,000 impulses for smaller spuds. The vibration intensity (amplitude) shall be sufficient to produce satisfactory consolidation.
5. Provide one vibrator (powered pneumatically or electrically) for each 10 cubic yards of concrete per hour being placed. Provide at least one vibrator, which may be of the gasoline powered type, as a standby for each two vibrators in service. To produce satisfactory consolidation, and based upon the observed performance, the Owner's representative may require the use of a larger sized and powered vibrator.
6. Check vibrators intended for regular service or standby service before beginning concreting operations.

3.06 FINISHING FORMED SURFACES

- A. Forms for walls, columns and sides of beams and girders shall be removed as specified in Section 03 11 00 "Concrete Forming." Patch, repair, finish and clean concrete after form removal. Finish concrete within 7 days of form removal. Cure concrete as finishing progresses.
- B. Air voids, for all types of finishes, are defects and shall be removed by rubbing or patching.
- C. Finish Schedule:

Type of Finish	Location
No Finish	Surfaces which are not visible from the inside or outside of the completed structure or more than 12" below finish grade (i.e. back of retaining walls below embankment, etc.)
Smooth Finish	Surfaces exposed to view and areas below to a point 12" below grade

- D. No Finish: After forms are removed, repair or patch-tie holes and defects. Otherwise, no additional finish is required.
- E. Smooth Finish: Unless otherwise shown on the schedule above, provide smooth form finish for concrete surfaces to be exposed to view. Surfaces to receive a rubbed finish shall have a smooth form finish. The form facing material shall produce a smooth, hard, uniform texture

on the concrete. The arrangement of the facing material shall be orderly and symmetrical with a minimum number of seams. Patch tie holes and defects and remove fins flush with the adjacent surface.

3.07 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Finish slabs, platforms and steps monolithically and apply as indicated on the Drawings and the following schedule of finishes:

Type of Finish	Location
Float Finish	Typical

- 1. Float Finish: Finish surfaces using a float to a true, even plane with no coarse aggregate visible. In the initial floating, while the concrete is plastic, use sufficient pressure on the float to bring excess moisture to the surface for removal. Apply a final “light float” finish to the surface as the concrete hardens. The surface shall have a uniform granular texture and shall meet the straightness requirements.
- C. Finishing in Hot, Dry Weather: During periods of high temperature and/or low humidity, take extreme care in finishing the slabs to eliminate initial shrinkage cracks. Following the initial set of concrete, but while the concrete is still “green” continue to finish as required to remove shrinkage cracks which may occur. In hot, dry weather, keep a cement finisher on the job following normal finishing operations for a sufficient length of time to insure the removal of initial shrinkage cracks.

3.08 MISCELLANEOUS CONCRETE ITEMS

- A. Normal Shrinkage Grouting:
 - 1. Prior to grout application, thoroughly clean the surface of all foreign matter and wet down. Thoroughly clean the foundation and the forms set in place and securely anchor, with holes or cracks in forms caulked with rags, cotton waste or dry sand mixture to prevent the loss of grout. The necessary materials and tools shall be on hand before starting grouting operations. Concrete shall be damp when the grout is poured, but shall not have excess water to dilute the grout.
 - 2. After wetting and just prior to grouting, sprinkle the surface lightly with cement to improve the bond between the grout and the surface.
 - 3. After mixing, quickly and continuously place the grout to avoid overworking, segregation and breaking down of the initial set. Mix and place the grout according to the manufacturer’s recommendations. Cure grout using wet curing method for concrete. Grout shall receive a steel trowel finish.
- B. Non-Shrink Grout:
 - 1. Obtain field technical assistance from the Grout manufacturer, as required, to insure that grout mixing and installation comply with the manufacturer’s recommendations and procedures.

2. Saturate the foundation for non-shrink grouts 24 hours before installation and clear of excess water. Free baseplates or bedplates of oil, grease, laitance and other foreign substances.
3. Place grout according to the manufacturer's directions so that spaces and cavities below the top of the baseplates and bedplates are completely filled. Provide forms where structural components of the baseplates or bedplates do not confine the grout. Where necessary and acceptable under the manufacturer's procedures, a round head pencil vibrator, 3/4-inch maximum diameter may be used to consolidate the grout.
4. Steel trowel finish the non-shrink grout where the edge of the grout is exposed to view and after the grout has reached its initial set. Cut off the exposed edges of the grout at a 45 degree angle to the baseplate, bedplate, member, or piece of equipment.
5. Wet curing should occur for at least 3 days, unless specified by manufacturer, with wet rags, wet burlap or polyethylene sheets. Keep cloths constantly wet for the curing cycle.
6. Clean and dry the foundation, baseplate or other surface of epoxy grouts prior to installation. Dry curing is acceptable for epoxy grouts.
7. Use epoxy non-shrink grout under all machinery, pumps, equipment, and where chemicals are present that would abate cementitious non-shrink grouts.
8. Mix, install, cure, and finish epoxy grouts according to the manufacturer's recommendations. Install grout in recommended lifts to prevent excess heat.

3.09 CONCRETE PROTECTION AND CURING

- A. General: Give careful attention to proper concrete curing. The curing methods shall be wet curing, sheet materials conforming to ASTM C171, or membrane curing compound conforming to ASTM C309. Membrane curing is not permitted on surfaces to be rubbed or on surfaces to which additional concrete, plaster mix mortar or terrazzo is to be applied. Unless the curing method is specified otherwise, select the appropriate curing method.
- B. Length of Curing Period:
 1. A "curing day" shall be any day on which the atmospheric temperature taken in the shade, or the air temperature adjacent to the concrete, remains above 50 F for at least 18 hours.
 2. Cure concrete for a period of 7 consecutive days. In cold weather, when curing may be retarded, extend this period to 7 "curing days", up to a limit of 14 consecutive days.
- C. Wet Curing:
 1. Immediately following the finishing operations, cover concrete slabs, including roof slabs, with wet cotton mats or with a temporary covering of canvas or burlap. Keep thoroughly wet for a period of 4 curing days after the concrete is placed. The covering shall be held in direct contact with the concrete. A temporary covering shall be required when the size of slab, size of mats, or other factors dictate that the mats cannot be placed immediately after the finishing operations without marring the finishing of the slab.
 2. Water used for curing shall be free from injurious amounts of oil, acid, alkali, salt, or other deleterious substances.

3. Canvas or burlap covering material shall weigh not less than 12 ounces per square yard. Place the sections with a lap at the edges of at least 8 inches. Saturate cover material with water previous to placing. Keep saturated as long as it remains in place. Use care in the placing of the cover material to prevent marring the concrete surface.
 4. When temporary coverings are used, keep them in place only until the slab has sufficiently hardened so that a cotton mat covering can be substituted without marring or disturbing the slab finish. Thoroughly saturate cotton mats before placing and keep the mats on the slab in a saturated condition for a period of at least 4 curing days.
- D. Sheet Curing: Sheet materials shall conform to ASTM C171. They shall be in contact with the entire concrete surface and applied according to the manufacturer's recommendations. Patch all holes. Where pedestrian traffic is unavoidable, provide suitable walkways to protect the sheet material.
- E. Membrane Curing:
1. Membrane curing shall not be used on surfaces which receive paint, floor hardener, or plaster mix finish or other finish which would be hindered by the use of the curing compound.
 2. Cover the surface of the concrete with a continuous, uniform, water-impermeable coating, conforming to ASTM C309 "Liquid Membrane Forming Compounds for Curing Concrete" and apply according to ACI 308.
 3. Immediately after the removal of the side and end forms, apply a coating to the sides and ends of all concrete. Apply the solution under pressure with a spray nozzle so that the entire exposed surface is completely covered with a uniform film. The rate of application shall insure complete coverage, but the area covered shall not exceed 150 square feet per gallon of curing compound.
 4. The coating shall be sufficiently transparent and free of permanent color to not result in a pronounced color change from that of the natural concrete at the conclusion of the curing period. The coating shall, however, contain a dye of color strength to render the film distinctively visible on the concrete for a period of at least 4 hours after application.
 5. After application and under normal conditions, the curing compound shall be dry to touch within 1 hour and shall dry thoroughly and completely within 4 hours. When thoroughly dry, it shall provide a continuous flexible membrane free from cracks or pinholes and shall not disintegrate, check, peel, or crack during the required curing period.
 6. If the seal is broken during the curing period, immediately repair it with additional sealing solution.

3.10 CONCRETE SURFACE REPAIRS

- A. After the tie rods are broken back or removed, thoroughly clean the holes to remove grease and loose particles. Patch holes with structural concrete repair material. After the holes are completely filled, strike off flush excess mortar and finish the surface to render the filled hole inconspicuous.

- B. If the surface of the concrete is bulged, uneven, or shows honeycombing or form marks, which in the Engineer's opinion cannot be repaired satisfactorily, remove and replace the entire section.
- C. Patch honeycomb and minor defects in all concrete surfaces with structural concrete repair material. Cut back each defective area with a pneumatic chipping tool as deep as the defect extends, but in no case less than 1/2 inch. Prepare the existing concrete according to the recommendations of patching material manufacturer's. Apply repair material according to the manufacturer's recommendations. Finish the surface of the patches to match finish on surrounding concrete.

3.11 FIELD QUALITY CONTROL

A. Testing:

1. General:

- a. Tests shall be required throughout the Work to monitor the quality of concrete. Samples shall be taken in accordance with ASTM C172.
- b. The Engineer may waive these requirements on concrete placements of ten cubic yards or less. However, evidence shall be furnished showing a design mix which meets the Specifications.
- c. Unless noted otherwise, testing of the materials, ready mix, transit mix or central plant concrete will be by an independent testing agency. The independent testing agency will be approved by the Owner and paid by the Contractor. A summary of all tests performed will be available. No concrete shall be placed without a representative present at either the plant or at the Site.
- d. Unless the Owner's laboratory is on the Site, provide housing for the curing and storage of test specimens and equipment.

2. Slump Test: Slump tests, in accordance with ASTM C143, shall be used to indicate the workability and consistency of the concrete mix from batch to batch. Generally, a slump test shall be made at the start of operations each day, at regular intervals throughout a working day, and at any time when the appearance of the concrete suggests a change in uniformity.

3. Air Content Test: Tests for the concrete's air content shall be made in accordance with ASTM C231 or ASTM C173, at the point of delivery of concrete, prior to placing in forms. The test shall be made frequently to monitor a proper air content uniform from batch to batch.

4. Temperature Test: The temperature of the concrete to be placed shall be taken with a thermometer immediately before placement, with the point of measurement being in the chute or bucket. Temperature test shall be performed for each truck. Record temperatures on batch ticket.

5. Compression Test:

- a. Compression test specimens shall be 6-by-12-inch concrete cylinders made and cured in accordance with ASTM C31. If the maximum aggregate size is no longer than 1 inch, 4-by-8-inch concrete cylinders are acceptable. No fewer than two 6-by-

12-inch or three 4-by-8-inch specimens shall be made for each test Sample. Samples shall be taken at a minimum of every 50 cubic yards of concrete for each class placed. At least one set of test specimens per day shall be made for each class of concrete used that day. Specimens shall be cured under laboratory conditions specified in ASTM C31. Additional concrete cylinders may be required for curing on the job under actual job curing conditions. These Samples could be required when:

- 1). There is a possibility of the air temperature surrounding the concrete falling below 40 F, or rising above 90 F.
 - 2). The curing procedure may need to be improved and/or lengthened.
 - 3). It is necessary to determine when the structure may be put into service.
- b. Compression strength tests shall be made on the laboratory-cured and job-cured concrete cylinders at 7 and 28 days, in accordance with ASTM C39. The value of each test result shall be the average compressive strength of all of the cylinders in the test Sample. All cylinders within a test Sample shall be taken at the same time from the same batch of concrete. For the 28-day cylinders, the strength level shall be satisfactory if the averages of all sets of three consecutive strength test results exceed the required design compressive strength, and no individual strength test result falls below the required compressive strength by more than 500 psi.
6. Failure to Meet Requirements:
- a. Should the 7-day strengths shown by the test specimens fall below the required values, additional curing shall be performed on those portions of the structures represented by the test specimens at the Contractor's expense. Test cores shall be obtained and tested in accordance with ASTM Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete, Designation C 42. If additional curing does not give the strength required, the Owner reserves the right to require strengthening, replacement of those substandard portions of the structure, or additional testing, at the Contractor's expense.
 - b. Upon receipt of the Contractor's written request, substandard concrete work may be reexamined in place by nondestructive testing methods or core Samples, in accordance with ACI 301. The services of an independent testing laboratory shall be retained and all expenses paid without compensation from the Owner. Laboratory results shall be evaluated by the Engineer, who shall make the final decision on acceptability of the concrete in question. Core Sample holes shall be repaired.
- B. The Owner may withhold payment for any section of concrete which does not meet the requirements of the Specifications. Withheld payment shall be based upon the unit prices established for concrete and reinforcing steel. Payment shall be withheld until the unacceptable concrete has been refinished, removed and replaced or otherwise brought into conformance with the Specifications.
- C. PVC Waterstops: Waterstops shall be observed by the Owner's representative prior to concrete placement. Unacceptable splicing defects include:
1. Misalignment of center bulb, ribs and end bulbs greater than 1/16 inch.
 2. Bond failure at joint deeper than 1/16 inch.

3. Misalignment which reduces waterstop cross-section more than 15 percent.
4. Bubble or visible porosity in the weld.
5. Visible signs of splice separation when a cooled splice is bent by hand at a sharp angle.
6. Charred or burnt material.

END OF SECTION

Concrete Mix Design

Project Name: _____
 FNI Project Number: _____
 Project Location: _____
 Owner: _____
 General Contractor: _____
 Mix Number / Class: _____

A. Mix Design:

Cement = _____ lb/yd³
 Fly Ash = _____ lb/yd³
 Other Cementitious Material: = _____ lb/yd³

 Fine Aggregate = _____ lb/yd³
 Course Aggregate = _____ lb/yd³
 Water = _____ lb/yd³
 Water Reducing Admixture = _____ oz/yd³
 High Range Water Reducer = _____ oz/yd³
 Air Entraining Admixture = _____ oz/yd³
 Other Admixture: = _____ oz/yd³

 Slump = _____ inches
 Gross Weight = _____ lb/yd³
 Air Content = _____ percent
 Water/Cement Ratio = _____

B. Materials:

	Source	ASTM	Type	Remarks
Cement				
Fly Ash				
Other Cementitious Material: _____				
Fine Aggregate				
Coarse Aggregate				
Water				
Water Reducer				
High Range Water Reducer				
Air Entraining				

	Source	ASTM	Type	Remarks
Other Admixture: _____				

C. Determination of Average Strength Required (f_{cr}):

1. Test Records Available:

A. Summary of Test Records (Provide Supporting Documentation):

Test Group No.	No. of Consecutive Tests	Specified Strength (psi)	Standard Deviation (psi)
Average Standard Deviation:			

B. Standard Deviation Modification Factor (ACI 30 1, Table 4.2.3.3.a): ____.

C. Standard Deviation Used: ____.

D. Average Compressive Strength Required: ____.

2. Test Records Not Available:

A. Average Compressive Strength Required (ACI 30 1, Table 4.2.3.3.b, if required): ____.

D. Documentation of Required Average Compressive Strength (Check One):

1. Field Strength:

A. Field Strength Test Records (ACI 30 1, Table 4.2.3.3.a): ____.

a. *Complete Attachment A.

2. Trial Mixtures:

A. Trial Mixtures (ACI 301, Table 4.2.3.3.b, if required): ____.

a. *Complete Attachment B.

I, _____ certify that the above information is correct and all gradations, cement certifications and test results are located at our place of business for review by the Engineer.

Name: _____ Date: _____

Title: _____

Company: _____

Address: _____

Attachment A

Documentation of Required Average Strength – Field Strength Records

(ACI 301, 4.2.3.4.a)

A. Summary of Test Records (Provide Supporting Documentation):

Test Record No.	No. of Tests in Record	Duration of Record (days)	Water-Cementitious Materials Ratio	Average Strength (psi)

B. Interpolation used? _____.

1. Provide an interpolation calculation or plot of strength versus proportions.

C. Submit the following data for each mix:

1. Brand, type and amount of cement.
2. Brand, type and amount of each admixture.
3. Source of each material used.
4. Amount of water.
5. Proportions of each aggregate material per cubic yard.
6. Gross weight per cubic yard.
7. Measured slump.
8. Measured air content.
9. Results of consecutive strength tests.

Attachment B

Documentation of Required Average Strength – Trial Mixtures

(ACI 301, 4.2.3.4.b)

A. Summary Of Test Record(s):

Trial Mix No.	7-Day Tests		28-Day Tests		Water-Cementitious Materials Ratio	Slump (in)	Air Content (percent)	Temperature (F)
	No. of Test Cylinders	Strength (psi)	No. of Test Cylinders	Strength (psi)				

B. Maximum water-cementitious materials ratio _____.

1. Provide an interpolation calculation or plot of strength versus water-cementitious materials ratio.

C. Submit the following data for each mix:

1. Brand, type and amount of cement.
2. Brand, type and amount of each admixture.
3. Amount of water used in trial mixes.
4. Proportions of each aggregate material per cubic yard.
5. Gross weight per cubic yard.
6. Measured slump.
7. Measured air content.
8. Compressive strength developed at 7 days and 28 days, from not less than three test cylinders cast for each 7-day and 28-day test.

END OF ATTACHMENTS

DIVISION 09

FINISHES

09 96 00 HIGH PERFORMANCE COATINGS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment, and incidentals necessary to apply protective coatings to material and equipment as specified herein, including the preparation of surfaces prior to application of coatings.

1.02 ABBREVIATIONS

- A. The following abbreviations are used in this Section:

Abbreviations	
ANSI	American National Standards Institute
AWWA	American Water Works Association
FRP	Fiberglass Reinforced Plastic
MDFT	Minimum Dry Film Thickness
MDFTPC	Minimum Dry Film Thickness Per Coat
mil	Thousandths of an Inch
MIL-P	Military Specification - Paint
OSHA	Occupational Safety and Health Act
PSDS	Paint System Data Sheet
SFPG	Square Feet Per Gallon
SFPGPC	Square Feet Per Gallon Per Coat
SP	Surface Preparation
SSPC	Steel Structures Painting Council

1.03 SUBMITTALS

- A. Product Data: Furnish the following Data Sheets:
 - 1. For each paint system used herein, furnish a Paint System Data Sheet (PSDS), Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system, except for products applied by equipment manufacturers. A sample PSDS form is appended at the end of this Section.
 - 2. The required information shall be submitted on a system-by-system basis.
 - 3. The Contractor shall also provide copies of the paint system submittals to the coating applicator.
 - 4. Indiscriminate submittal of manufacturer's literature only is not acceptable.
- B. Where ANSI/NSF Standard 60 and 61 approval is required, submit ANSI/NSF certification letter for each coating in the system indicating product application limits on size of tank or

pipings, dry film thickness, number of coats, specific product tested, colors certified, and approved additives.

- C. Provide TCLP test data for lead and other regulated heavy metals in non-recyclable, slag type abrasive blast media to be used on the Project. Acceptable abrasive test data shall indicate the abrasive manufacturer, location of manufacture, and media gradation and type. Surface preparation will not be permitted to begin until acceptable test data has been submitted.
- D. Colors charts of each paint system.
- E. Quality Control Submittals: Furnish the following:
 - 1. Applicator's Experience: List of references substantiating the requirements as specified.
 - 2. Factory Applied Coatings: Manufacturer's certification stating factory applied coating systems meets or exceeds requirements specified herein.
 - 3. If the manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmation that materials are compatible.

1.04 QUALITY ASSURANCE

- A. The paint manufacturer shall provide a representative to visit the jobsite at intervals during surface preparation and painting as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions and the Contract Documents, and as may be necessary to resolve field problems attributable to, or associated with, the manufacturer's products furnished under this Contract.
- B. Applicator's Experience: Minimum of 5 years practical experience in application of specified products. Submit a list of recent projects and names of references for those projects. The Engineer will waive the requirement for 5 years' experience, when at the discretion of the Engineer, the applicators' experience and capabilities meet the intent of the experience requirement.
- C. Continuity of Contractor: Contractor's site supervisor shall be coordinated with the Engineer. Any replacement of the supervisor on-site will require notification of Engineer 72 hours in advance, and will be subject to approval by the Owner.
- D. Inspection:
 - 1. Inspect and provide substrate surfaces prepared in accordance with the Contract Documents and the printed directions and recommendations of paint manufacturer whose product is to be applied.
 - 2. Provide Engineer minimum 3 days' advance notice prior to start of surface preparation work or coating application work.
 - 3. Perform Work only in the presence of Engineer, unless Engineer grants prior approval to perform such Work in Engineer's absence. Approval to perform Work in the Engineer's absence is limited to the current day unless specifically noted to extend beyond the completion of the work day.

4. Inspection by the Engineer, or the waiver of inspection of any particular portion of the Work, shall not be construed to relieve the Contractor of responsibility to perform the Work in accordance with the Contract Documents.

1.05 PAINT DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint to the Site in unopened containers that plainly show, at the time of use, the designated name, manufacturer date, color, and name of manufacturer.
- B. Store paints in a suitable protected area that is heated or cooled as required to maintain temperatures within the range recommended by the paint manufacturer.
- C. Shipping:
 1. Where precoated items are to be shipped to the jobsite, protect coating from damage. Batten coated items to prevent abrasion.
 2. Use nonmetallic or padded slings and straps in handling.
 3. Items will be rejected for excessive damage.

1.06 WARRANTY

- A. The Contractor and coating manufacturer shall jointly and severally warrant to the Owner and guarantee the Work under this Section against defective workmanship and materials for a period of 2 years commencing on the date of final acceptance of the Work.
- B. A warranty inspection shall be conducted 1 month prior to expiration of the warranty period. Any defective Work discovered at this date shall be corrected by the Contractor in accordance with the Contract Documents at no additional cost to the Owner. Other corrective measures may be required during the 2 year warranty period.

1.07 PAINT AND COATINGS MANUFACTURERS

- A. A manufacturer letter code as follows will be found following the generic descriptions of materials outlined in this Section. Address is that of the general offices. Contact these offices for information regarding the location of representative nearest the Site.
- B. Manufacturer Code A – Coatings manufacturers (able to supply most heavy-duty industrial coatings and architectural paints):
 1. Carboline Coatings Company, St. Louis, MO.
 2. Sherwin Williams, Cleveland, OH.
 3. Tnemec Coatings, Kansas City, MO.
- C. Manufacturer Code E – Fusion bonded coating applicators:
 1. 3M Co., St Paul, MN.

2.00 PRODUCTS

2.01 PAINT MATERIALS

- A. Products shall meet federal, state, and local requirements limiting the emission of volatile organic compounds. Specific information may be secured through the local office of the Air Pollution Control Officer.
- B. Materials Including Primer and Finish Coats: Produced by same paint manufacturer.
- C. Thinners, Cleaners, Driers, and Other Additives: As recommended by paint manufacturer of the particular coating. Where coatings are required to meet ANSI/NSF Standard 60 and 61, addition of thinners, driers, and other paint additives not approved under the ANSI/NSF certification letter will not be permitted without written approval from the Engineer.
- D. Paint products are listed according to their approximate order of appearance in the paint systems. The letter designating the manufacturer code refers to the codes in Paragraph 1.07.

Product	Definition
Polyamide Epoxy, High Solids	Polyamide or polyamine cured epoxy, capable of 4 to 8 MDFT per coat, percent of volume solids 70% minimum, suitable for immersion or buried service. MANUFACTURER CODE: A
Moisture Cured Zinc Primer	Single component, moisture cured urethane based, 12 lb. metallic zinc content per gallon minimum, unlimited recoat period. MANUFACTURER CODE: A
Moisture Cure Urethane	Single component, moisture cured urethane intermediate and top coat, suitable for high humidity and condensation, unlimited recoat period. MANUFACTURER CODE: A
Inorganic Zinc Primer	Solvent or water based, 14 lb. metallic zinc content per gallon minimum; follow manufacturer's recommendation for top coating. MANUFACTURER CODE: A
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish, high build. MANUFACTURER CODE: A
Rust-Inhibitive Primer	Single-package steel primers with anti-corrosive pigment loading; may be alkyd, vinyl, epoxy ester, chlorinated rubber. MANUFACTURER CODE: A
Alkyd Enamel	Optimum quality, gloss finish, medium long oil. MANUFACTURER CODE: A
Wash Primer	Vinyl butyral acid MANUFACTURER CODE: A
Polyurethane	Self-priming, plural component, 100 percent solids, non-extended polyurethane, suitable for burial or immersion, and shall be one of the approved products as specified in Section 09 97 16 "Pipeline Coatings and Linings."

Product	Definition
Fusion Bonded Coating	100% solids, thermosetting, fusion bonded, dry powder epoxy or polyurethane resin, suitable for this intended service. MANUFACTURER CODE: E

2.02 COLORS

- A. All reuse piping shall be painted purple in accordance with TCEQ requirements.
- B. Formulated with colorants free of lead, lead compounds, or other materials which might be affected by the presence of hydrogen sulfide or other gas likely to be present at the Project.
- C. Proprietary identification of colors is for identification only. Any authorized manufacturer may supply matches.

2.03 INSPECTION TEST EQUIPMENT

- A. Provide a magnetic type or electronic dry film thickness gauge to test coating thickness specified in mils, as manufactured by:
 - 1. Nordson Corp., Anaheim, CA, Mikrotest.
 - 2. DeFelsko Corp., Anaheim, CA, Positector.
 - 3. Or equal.
- B. Provide an electrical holiday detector, low voltage, wet sponge type to test finish coatings less than 20 mils in thickness, except zinc primer, high-build elastomeric coatings, and galvanizing, for holidays and discontinuities as manufactured by:
 - 1. Tinker and Razor, San Gabriel, CA, Model M-1.
 - 2. Or equal.
- C. Provide an electrical holiday detector, high voltage, pulse type to test elastomeric coatings and coating systems in excess of 20 mils dry film thickness, except zinc primer, for holidays and discontinuities as manufactured by:
 - 1. Tinker and Razor, San Gabriel, CA, Model AP-W.
 - 2. D. E. Stearns Company, Shreveport, LA, Model 14/20.
 - 3. Elcometer, Rochester Hills, Michigan.
 - 4. Or equal.

3.00 EXECUTION

3.01 GENERAL

- A. The intention of this Section is for all new, interior and exterior metal, and submerged metal surfaces to be painted, whether specifically mentioned or not, except as modified herein. Concealed structural steel surfaces shall receive prime coat only unless modified herein.
- B. Surface preparation and coating application shall be in conformance with the Specifications and the coating manufacturer's written Product Data sheets and written recommendations

of the manufacturer's technical representative. Where conflicts occur between the manufacturer's recommendations and the Specifications, the more stringent of the two shall apply unless approved by the Engineer.

- C. For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating for any purpose until completion of curing cycle.

3.02 REGULATORY REQUIREMENTS

- A. Meet federal, state, and local requirements limiting the emission of volatile organic compounds and worker exposures.
- B. Protect workers and comply with applicable federal, state, and local air pollution and environmental regulations for surface preparation, blast cleaning, disposition of spent aggregate and debris, coating application and dust prevention including, but not limited to the following Acts, Regulations, Standards, and Guidelines:
 - 1. Clean Air Act.
 - 2. National Ambient Air Quality Standard.
 - 3. Resource Conservation and Recovery Act (RCRA).
- C. Comply with applicable federal, state, and local regulations for confined space entry.
- D. Provide and operate equipment that meets explosion proof requirements.

3.03 ENVIRONMENTAL CONDITIONS

- A. Do not perform abrasive blast cleaning whenever the relative humidity exceeds 85 percent, whenever surface temperature is less than 5 degrees F above the dew point of the ambient air.
- B. Surface preparation power tools and blast equipment shall contain dust collection equipment that will prevent discharge of dust particles into the atmosphere when surface preparation work is located within enclosures or confined areas with electrical equipment, motors, instrumentation, or other equipment that may be damaged by airborne dust and particles.
- C. Do not apply paint when:
 - 1. Surface temperatures exceeds the maximum or minimum temperature recommended by the paint manufacturer,
 - 2. In dust, smoke-laden atmosphere, damp or humid weather, or under conditions which could cause icing on the metal surface.
 - 3. When it is expected that surface temperatures will drop below 5 degrees F above dew point within 8 hours after application of coating.

3.04 DEHUMIDIFICATION

- A. Where weather conditions or Project requirements dictate, Contractor shall provide and operate dehumidification equipment to maintain environmental conditions suitable for abrasive blasting and coating application as specified.

- B. Contractor shall provide dehumidification equipment sized to maintain dew point temperature 5 degrees F or more below surface temperature of metal surfaces to be cleaned and painted.
- C. Cleaned metal surfaces shall be prevented from flash rusting throughout the Project duration, condensation or icing shall be prevented throughout surface preparation and coating application.
- D. Equipment size and power requirements shall be designed by personnel trained in the operation and setup of dehumidification equipment based on Project requirements and anticipated weather conditions.
- E. Dehumidification equipment shall operate 24 hours per day and continuously throughout surface preparation and coating application.
- F. Contractor to provide personnel properly trained in the operation and maintenance of the dehumidification equipment or provided training by the dehumidification equipment Supplier.
- G. Daily maintenance requirements of the equipment shall be documented in writing and posted near the equipment for review by the Engineer.
- H. Reblasting of flash rusted metal surfaces or removal of damaged coatings, as a result of equipment malfunction, shutdown, or other events that result in the loss of environmental control, will be at the sole expense of the Contractor.

3.05 VENTILATION AND ILLUMINATION

- A. Adequate illumination shall be provided while Work is in progress. Whenever required by the inspector, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the inspector.
- B. Ventilation shall be used to control potential dust and hazardous conditions within confined areas. Ventilation flow rates shall be in accordance with OSHA regulations and as required to reduce air contamination to nonhazardous conditions.

3.06 SURFACES NOT REQUIRING PAINTING

- A. Unless otherwise stated herein or shown, the following areas or items will not require painting:
 - 1. Concrete and masonry surfaces.
 - 2. Nonferrous and corrosion-resistant ferrous alloys such as copper, bronze, monel, aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where:
 - a. Required for electrical insulation between dissimilar metals.
 - b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry.
 - c. Color coding of equipment and piping is required.

3. Nonmetallic materials such as glass, PVC, wood, porcelain, and plastic (FRP) except as required for architectural painting or color coding.
4. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, acoustical tile, cabinets, elevators, building louvers, wall panels, etc.; color coding of equipment is required.
5. Nonsubmerged electrical conduits attached to unpainted concrete surfaces.
6. Cathodic protection anodes.
7. Items specified to be galvanized after fabrication unless specifically required elsewhere or subject to immersion.

3.07 PREPARATION OF SURFACES

A. Surface Preparation Inspection:

1. Inspect and provide substrate surfaces prepared in accordance with the Contract Documents and the printed directions and recommendations of paint manufacturer whose product is to be applied.
2. Provide Engineer minimum 3 days' advance notice prior to start of surface preparation work or coating application work.
3. Perform such Work only in the presence of Engineer, unless Engineer grants prior approval to perform such Work in Engineer's absence.

B. Metal Surface Preparation:

1. General:

- a. Do not perform a surface preparation blast prior to submission of Samples. Workmanship for metal surface preparation as specified shall meet current Steel Structures Painting Council (SSPC) Specifications as follows:
 - 1). Solvent Cleaning: SP 1.
 - 2). Hand Tool Cleaning: SP 2.
 - 3). Power Tool Cleaning: SP 3.
 - 4). White Metal Blast Cleaning: SP 5.
 - 5). Commercial Blast Cleaning: SP 6.
 - 6). Brush-Off Blast Cleaning: SP 7.
 - 7). Pickling: SP 8.
 - 8). Near-White Blast Cleaning: SP 10.
 - 9). Bare Metal Power Tool Cleaning: SP 11.
- b. All surface preparation of new equipment and surfaces shall be assumed to be on a SSPC Grade A steel surface condition, unless specifically noted otherwise.
- c. Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning", or similar words of equal intent are used in the Specifications or in

paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC Specifications listed above.

- d. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturers' recommendations for wet blast additives and first coat application shall apply.
 - e. Hand tool clean areas that cannot be cleaned by power tool cleaning.
2. Welds and adjacent areas:
- a. Prepared such that there is:
 - 1). No undercutting or reverse ridges on the weld bead.
 - 2). No weld spatter on or adjacent to the weld or any other area to be painted.
 - 3). No sharp peaks or ridges along the weld bead.
 - b. Grind embedded pieces of electrode or wire flush with the adjacent surface of the weld bead.
3. Preblast Cleaning Requirements:
- a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.
 - b. Cleaning methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.
 - c. Clean small isolated areas as above or solvent cleaned with suitable solvents and clean cloths.
 - d. Round or chamfered all sharp edges and grind smooth burrs, jagged edges, and surface defects.
4. Blast Cleaning Requirements:
- a. General:
 - 1). Type of Equipment and Speed of Travel: Designed to obtain specified degree of cleanliness.
 - 2). Select type and size of abrasive to produce a surface profile that meets the coating manufacturer's recommendations for the particular coating to be applied or not less than 20 percent of the specified coating thickness, whichever is more stringent.
 - 3). Meet applicable federal, state, and local air pollution control regulations for blast cleaning and disposition of spent aggregate and debris.
 - 4). Do not reuse abrasive, unless abrasive is a recyclable abrasive.
5. Shop Blasting:
- a. Notify Engineer at least 7 days prior to start of shop blast cleaning to allow for inspection of the Work during surface preparation and shop application of paints. Work shall be subject to the Engineer's approval before shipment to the jobsite.

- b. Items such as structural steel, metal doors and frames, metal louvers, and similar items as reviewed by the Engineer may be shop prepared and primed. Centrifugal wheel blast cleaning is an acceptable alternate to shop blast cleaning. Blast clean and prime in accordance with the Specifications.
- 6. Field Blasting:
 - a. Perform sandblasting for items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed. Materials, equipment, procedures, shall meet requirements of Steel Structures Painting Council.
 - b. Field blasting in areas with electrical or mechanical equipment, or within buildings shall be performed with dustless abrasive systems such as "Sponge-Jet", dry ice abrasive blasting.
- 7. Post-Blast Cleaning and Other Cleaning Requirements:
 - a. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wiped with a tack cloth.
 - b. Paint surfaces the same day they are sandblasted. Reblast surfaces that have started to rust before they are painted.
- C. Concrete Surface Preparation:
 - 1. Do not begin until 30 days after the concrete has been placed or 7 days if steam cured.
 - 2. Remove grease, oil, dirt, salts or other chemicals, loose materials or other foreign matter by solvent, detergent, or other suitable cleaning methods.
 - 3. Clean concrete using mechanical or chemical methods for the degree of cleaning specified for the coating system in accordance with SSPC SP-13, Surface preparation of Concrete.
 - 4. Unless otherwise required for proper adhesion, ensure surfaces are dry prior to coating.
 - 5. Bug holes, air pockets, and other voids in the concrete will be filled or patched in chemical exposure areas, secondary containment, and where specifically required.
 - 6. Concrete Surface Preparation Inspection:
 - a. Adhesion Testing:
 - 1). Tensile testing of the surface preparation shall be performed by the Engineer as necessary using Type 4 or Type 5 pneumatic adhesion testing equipment in accordance with ASTM D4541 using 2-inch diameter dollies for concrete surface adhesion testing.
 - 2). Concrete surface or applied coating shall be scored for concrete adhesion testing.
 - 3). Adhesive failure greater than 50 percent of the dolly surface area shall indicate inadequate surface preparation.

- 4). Cohesive failures which results in loss of sound concrete will be acceptable provided the loss is greater than 50 percent of the dolly surface area.
 - 5). Low adhesion cohesive failures with a thin layer of concrete due to weak concrete or laitance over 50 percent of the dolly surface will be rejected.
 - b. Concrete Soundness:
 - 1). Concrete soundness shall be determined using the scratching or hammer impact methods as defined in SSPC SP-13.
 - c. Moisture Content:
 - 1). Moisture shall be tested as Specified in SSPC SP-13 and shall not exceed the moisture content recommended by the coating manufacturer.
- D. Preparation of Existing Coated or Shop Primed Surfaces:
1. General:
 - a. Shop primed or coated surfaces shall be reviewed with the Engineer to determine if the extent of damage to the coating and suitability of finish coats to adhere to shop applied coats.
 - b. If a cured epoxy, polyurethane, or plural-component material is to be top coated, brush-off blast as specified herein or as recommended by the existing coating manufacturer.
 - c. Surface preparation recommendations of coating manufacturer shall be subject to approval of the Engineer.
 2. To be Recoated or Final Coated:
 - a. Detergent wash and freshwater rinse.
 - b. Perform touch-up repairs of existing coating.
 - c. Asphaltic varnish coated ductile iron pipe will require an application of a seal coat prior to the application of a cosmetic finish coat.
 3. Touch-up Repairs:
 - a. Clean loose, abraded, or damaged coatings to substrate by power tool to bare metal, SP-11.
 - b. Feather surrounding intact coating.
 - c. Apply one spot coat of the specified primer to bare areas overlapping the prepared existing coating.
 - d. Apply one full finish coat of the specified primer or finish coat(s) overall.
 4. Application of a Cosmetic Coat:
 - a. The exact nature of shop-applied coatings is not known in all cases.
 - b. Check compatibility by application to a small area prior to starting the coating.
 - c. If lifting or other problems occur, request disposition from the Engineer.
- E. Brush-off Blast Cleaning:

1. Equipment, procedure, and degree of cleaning shall meet SSPC-SP 7, Brush-off Blast Cleaning.
 2. Abrasive: Either conventional abrasive blasting with sand, grit, or nut shells or specialized abrasive blasting, such as dry ice or "Sponge-Jet" technologies. Abrasives shall be 60 mesh grit, maximum.
 3. Select various surface preparation parameters such as size and hardness of the abrasive, nozzle size, air pressure, and nozzle distance from the surface such that the surface is cleaned without pitting, chipping, or exposure of metal substrate.
 4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
 5. The Engineer shall approve trial blast cleaned area and shall use area as a representative Sample of surface preparation.
 6. Surface profile shall have the appearance of 100 grit sandpaper with no exposed metal substrate.
 7. Repair or replace coated surfaces damaged by blast cleaning, where damage is defined as visible metal substrate. If less than 5 percent of prepared surface has the metal substrate visible, the coating shall be repaired by application of a brush applied coat. If greater than 5 percent the coating shall be fully removed to meet the specified surface cleanliness.
- F. Solvent Cleaning:
1. Consists of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by the use of solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods which involve a solvent or cleaning action.
 2. Method meets SSPC-SP 1.

3.08 PROTECTION OF SURFACES NOT TO BE PAINTED

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted.
- B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
- D. Mask openings in motors to prevent paint and other materials from entering the motors.

3.09 PAINT MIXING

- A. Multiple-component coatings:
 1. Prepare using all of the contents of the container for each component as packaged by the paint manufacturer.
 2. No partial batches will be permitted.

3. Do not use multiple-component coatings that have been mixed shall not be used beyond their pot life.
 4. Provide small quantity kits for touchup painting and for painting other small areas.
 5. Mix only components specified and furnished by the paint manufacturer.
 6. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.
- B. Keep paint materials sealed when not in use.
- C. Where more than one coat of a material is applied within a given system, alternate color to provide a visual reference that the required number of coats have been applied.

3.10 APPLICATION OF PAINT

A. General:

1. Inspection: Schedule with Engineer in advance for cleaned surfaces and all coats prior to the succeeding coat.
 2. Apply coatings in accordance with the paint manufacturer's recommendations. Allow sufficient time between coats to assure thorough drying of previously applied paint.
 3. Fusion Bonded Coatings Method Application: Electrostatic, fluidized bed, or flocking.
 4. Paint units to be bolted together and to structures prior to assembly or installation.
 5. Shop Primed or Factory Finished Surfaces:
 - a. Inspection: Schedule with Engineer in advance for shop primed or factory-finished items delivered to the Site for compliance with the Specifications.
 - b. Power sand areas of chipped, peeled, or abraded coating, feathering the edges. Follow with a spot primer using specified primer.
 - c. For two-package or converted coatings, consult the coatings manufacturer for specific procedures as relates to top coating of products.
 - d. Prior to application of finish coats, clean shop primed surfaces of dirt, oil, and grease, and apply a mist coat of specified primer, 1.0 mil dry film thickness.
 - e. After welding, prepare and prime holdback areas as required for the specified paint system. Apply primer in accordance with manufacturer's instructions.
 6. Manufacturer Applied Paint Systems:
 - a. Repair abraded areas on factory-finished items in accordance with the equipment manufacturer's directions.
 - b. Carefully blend repaired areas into the original finish.
- B. Application Safety:
1. Performed painting in accordance with recommendations of the following:
 - a. Paint manufacturer's instructions.
 - b. NACE contained in the publication, Manual for Painter Safety.

- c. Federal, state, and local agencies having jurisdiction.
 2. Contractor will be solely and completely responsible for condition of the Site, including safety of all persons (including employees) and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. Safety provisions will conform to U.S. Department of Labor, Occupational Safety and Health Act, any equivalent state law, and all other applicable federal, state, county, and local laws, ordinances, and codes.
 3. Contractor will comply with all safety-training requirements promulgated or required for this Project.
- C. Film Thickness:
1. Coverage is listed as either total minimum dry film thickness in mils (MDFT) or the spreading rate in square feet per gallon (SFPG). Per coat determinations are listed as MDFTPC or SFPGPC.
 2. Applied coating system film thickness per coat shall be applied at the specified coating thickness or the manufacturer's recommended minimum thickness, whichever is greater. Where the manufacturer has not specified a minimum coating thickness on the Product Data sheets, the minimum recommended coating application thickness shall apply.
 3. Maximum film build per coat shall not exceed the coating manufacturer's recommendations.
 4. Surfaces that are subject to immersion, condensing environments, or where specifically specified shall be stripe coated on all angles, edges, corners, threads, welds, and similar type surfaces. Stripe coat shall be an extra coat of the intermediate or topcoat material. The stripe coat shall be a separate coat of paint from coats specified under the coating system. Stripe coats shall be alternated in color similar to a full coat.
 5. Number of coats: Minimum required irrespective of the coating thickness. Additional coats may be required to obtain the minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.
- D. Porous Surfaces, Such as Concrete, Masonry:
1. Prime Coat:
 - a. May be thinned to provide maximum penetration and adhesion.
 - b. Type and Amount of Thinning: Determined by the paint manufacturer and is dependent on surface density and type of coating.
 - c. Surfaces Specified to Receive Water Base Coating: Damp, but free of running water, just prior to application of the coating.
- E. Damaged Coatings, Pinholes, and Holidays:
1. Feather edges and repaired in accordance with the recommendations of the paint manufacturer.

2. Repair fusion bonded coatings to be as recommended by the original applicator. Applicator shall provide liquid repair kits for this purpose as recommended by the coating manufacturer.
3. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

F. Unsatisfactory Application:

1. If the item has an improper finish color, or insufficient film thickness, clean and topcoat surface with specified paint material to obtain the specified color and coverage. Obtain specific surface preparation information from the coating manufacturer. Hand or power sand visible areas of chipped, peeled, or abraded paint and feather the edges. Follow with primer and finish coat in accordance with the Specifications. Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required.
2. Evidence of runs, bridges, shiners, laps, or other imperfections shall be cause for rejection.
3. Repair defects in coating system per written recommendations of coating manufacturer.
4. Leave all staging up until the Engineer has inspected the surface or coating. Replace staging removed prior to approval by Engineer.

3.11 COATING INSPECTION

A. General:

1. Film thickness measurements and electrical inspection of the coated surfaces:
 - a. Perform with properly calibrated instruments.
2. Recoat and repair as necessary for compliance with the Specifications.
3. All coats will be subject to inspection by the Engineer and the coating manufacturer's representative.
4. Visually inspect concrete, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.
5. Give particular attention to edges, angles, flanges, and other areas where insufficient film thicknesses are likely to be present and ensure proper milage in these areas.

B. Coating Thickness Testing:

1. Engineer shall conducted coating thickness testing as necessary and without limitation. Testing conformance to the requirements of SSPC PA-2 is specifically excluded from this Section.
2. Measure coating thickness specified in mils with a magnetic type dry film thickness gauge as specified.
3. Check each coat for the correct milage. Do not make measurement before a minimum of 8 hours after application of the coating.
4. Tests for concrete coating thickness shall be with a Tooke Gauge, a destructive test. Contractor shall repair coating after thickness testing.

C. Coating Continuity Testing:

1. Test finish coat, except zinc primer, galvanizing, and elastomeric coatings in excess of 20 mils dry, for holidays and discontinuities with an electrical holiday detector, low voltage, wet sponge type as specified.
2. Holiday detect coatings in excess of 20 mils dry and concrete and secondary containment coatings with high voltage units recommended by the coating manufacturer in accordance with NACE RP0188.
3. Holiday detect coatings on pipe for buried application with high voltage spark tester in accordance with NACE RP0274.

3.12 CLEANUP

- A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroyed at the end of each day.
- B. Upon completion of the Work, remove staging, scaffolding, and containers from the Site or destroy in a legal manner.
- C. Completely remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.
- D. Damages due to over spray on buildings, vehicles, trees, or other surfaces not specified to be painted would be the responsibility of the Contractor.

3.13 MANUFACTURER' SERVICES

- A. Furnish paint manufacturer's representative to visit the Site at intervals during surface preparation and painting as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions and the Contract Documents, and as may be necessary to resolve field problems attributable to, or associated with, manufacturer's products furnished under this Contract.

3.14 PROTECTIVE COATING SYSTEMS AND APPLICATION SCHEDULE:

- A. Unless otherwise shown or specified in the Contract Documents, paint or coat the Work in accordance with the following application schedule.
- B. In the event of discrepancies or omissions in the following, request clarification from the Engineer before starting the Work in question.

System No.	Title
4	Exposed Metal - Highly Corrosive

- C. System No. 4 Exposed Metal - Highly Corrosive:

1. Surface Preparation and Coating System:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast, or Centrifugal Wheel Blast (SP 10)	Moisture Cured Zinc Rich Primer	1 coat, 3 MDFT

Surface Prep.	Paint Material	Min. Coats, Cover
	Moisture Cured Urethane	1 coat, 5 MDFT
	Moisture Cured Urethane	1 coat, 5 MDFT

2. Application:

- a. All new exposed metal surfaces, located inside of structures, manholes, or vaults and/or subject to high humidity or condensation.
- b. All surfaces with shop applied fusion bonded epoxy or other two component coating system shall be prepared as specified for Existing or Shop Applied coatings and top coated with the specified coating material. Final color shall be uniform in appearance.
- c. Moisture cured urethane coatings as specified are available from Wasser Chemical and Sherwin Williams. Other coating manufacturers will only be considered if the product complies with the unlimited recoat window.

END OF SECTION

(SEE PSDS FORM FOLLOWING THIS SECTION)

PAINT SYSTEM DATA SHEET

Attached products' Technical Data Sheet (if applicable) to this sheet for each paint system submittal.

Paint System Number (from spec.):		
Paint System Title (from spec.):		
Coatings Manufacturer:		
Representative:		
Surface Preparation:		
Paint Material (Generic)	Product Name/Number Proprietary)	Min. Coats, Coverage

Additional Information Required (check applicable items):

- ANSI/NSF Certification letter for each paint material listed above requiring ANSI/NSF Standard 60 and 61 approval.
- Manufacturer's minimum and maximum recommended coating thickness per coat and for total coating system.
- Immersion coating cure requirements from minimum coating application temperature to 100 degrees in 15-degree temperature increments.

DIVISION 26
ELECTRICAL

SECTION 260500**ELECTRIC CONDUCTOR****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Electric Conductors for Traffic Signals and/or Street Lighting.

1.02 REFERENCES

- A. TxDOT Item 620
- B. TxDOT Standard Details included in the plans.
- C. Traffic Signal Plans and/or Street Lighting Plans.

1.03 RELATED SECTIONS

- A. Section 344113 – Installation of Highway Traffic Signal
- B. Section 270500 – Conduit

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 620.
- B. All electrical connectors for breakaway poles shall be breakaway (BUSSMAN HEBW, LITTLEFUSE LEB, FERRAZ-SHAWMUT FEB, HMC FLOOD-SEAL SLK-MD or approved equal) in accordance with the latest TxDOT RID standards. All electrical connections for neutrals shall be breakaway and shall have a white colored marking and a permanently installed solid neutral (BUSSMAN HET, LITTLEFUSE LET, FERRAZ-SHAWMUT FEBN, HMC FLOOD-SEAL SDK-MD or approved equal).
- C. A continuous bare or green insulated copper wire No.6 or larger shall be installed in every conduit throughout the electrical and the traffic signals system in accordance with TxDOT Item 680, the electrical details, and the current edition of the National Electrical Code. This bare or green insulated copper wire shall be stranded for this project.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 620.
- B. Where two or more conductors are present in one conduit or enclosure, the conductors shall be identified as shown in the electrical details. If the identification tag with two plastic straps is too large for the referenced conductors, a tag with a single plastic strap may be used if

approved by the city. In any case, each tag shall indicate circuit number, letter, or other identification as shown in the plans.

- C. Grounding conductors that share the same conduit, junction box, ground box or structure shall be bonded together at every accessible point in accordance with the current edition of the National Electric Code.
- D. Electrical work performed by non-certified persons is not in accordance with the requirements of the contract and may be rejected as unsuitable for use due to poor workmanship. The required electrical certification course is available and is scheduled periodically by TEEEX. Alternatively, the Contractor may purchase an entire course for their personnel to be held at a time and location of their choice as negotiated through TEEEX. For more information, contact: TEXAS ENGINEERING EXTENSION SERVICE (TEEX), TxDOT ELECTRICAL SYSTEM COURSE, (979) 845-6563

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a Linear Foot (LF) basis for each single conductor, complete in place. The length is the straight line distance between the ground boxes, foundations, or pads.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Electric Conductor." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work.
- B. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the Bid Form.

END OF SECTION

SECTION 265619**LUMINAIRE POLE****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Luminaire Poles for City of Frisco standard street lighting.

1.02 REFERENCES

- A. Manufacturer's Standard Details and Specifications for Luminaire Pole.

1.03 RELATED SECTIONS

- A. Section 033101 – Drilled Shaft Foundation
- B. Section 265620 – Luminaire Fixture
- C. Section 260500 – Electric Conductor
- D. Section 260501 – Electrical Service
- E. Section 344135 – Ground Box
- F. Section 347113– Barricades, Signs, and Traffic Handling

1.04 SUBMITTALS

- A. Manufacturer's Standard Details and Specifications.
- B. The Contractor shall furnish four (4) sets of submittals of the carbon steel pole to the City. These submittals shall be approved by the City before the Contractor begins work.
- C. Prior to beginning fabrication, two (2) copies of the completed material identification form shall be furnished to the City.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials furnished by the Contractor shall be new, UL-listed, meet NEMA, NEC, AASHTO, and the Electrical Detail standard sheet requirements.
- B. The lighting assembly pole shall be 29.5 feet in height. The pole shall be a round tapered 11 gauge steel shaft with hand hole. Poles shall include breakaway coupling system that includes four couplings with associated hardware and a two piece aluminum skirt with attachment hardware. The aluminum skirt finish match color and type of finish specified for the light pole. The breakaway coupling system shall conform to current AASHTO standards and shall be approved by FHWA for breakaway characteristics at impact speeds for 20 to 60 mph.

- C. The assembly will contain either one or two bracket arms. The bracket arm shall be 4 foot in length, have a 2 3/8 inch OD and have a 21 inch upsweep. Finish color and finish type shall match that specified for the light pole.
- D. Luminaire Poles shall be either one of the following types:
 - 1. Valmont Industries, Inc. Twin Arm Catalog No. DS30-750A290-4D-FP with 30"x96" concrete pier.
 - 2. KW RTSU30-7.5-11-BLK-24S- BSC-1.0-SKT-NC
- E. All Luminaire Poles shall have a powder-coated paint finish of RAL9017 (TRAFFIC BLACK) unless otherwise directed by the City. All assemblies shall be hot dipped galvanized to ASTM 123 and 153 specifications. Once galvanizing is completed, all exposed surfaces shall be mechanically etched by blast cleaning to remove mill scale, impurities and non-metallic foreign materials. All surfaces visually exposed are to be coated with a Urethane or Triglycidyl (TGIC) Polyester Powder to a minimum film thickness of 2.0 mils. The coating shall be electrostatically applied and cured in a gas fired convention oven by heating the steel substrate between 350 and 400 degrees Fahrenheit.

PART 3 - EXECUTION

3.01 PREPARATION

- A. The Contractor shall notify the Traffic Department (Tracy Nichols) at least 7 business days prior to any work on this project and provide a construction schedule with weekly progress reports.
- B. The Contractor shall clean up and remove all loose material resulting from construction operations.
- C. All electrical work shall be in accordance with the most current National Electrical Code, City and TxDOT specifications and standards.
- D. The Contractor shall coordinate electrical services with the City of Frisco and either ONCOR or COSERV representatives (according to their respective area).
- E. Proposed street light pole foundations shall be staked by the Contractor and approved by the City prior to installation.
- F. Erection of poles, luminaries and structures located near any overhead or underground utilities shall be accomplished using established industry and utility safety practices. The Contractor shall consult with the appropriate utility company and TxDOT prior to beginning such work.
- G. All shop drawings, working drawings or other documents which require review by the City and shall be submitted by the Contractor sufficiently in advance of scheduled construction to allow no less than 14 calendar days for review and response by the City.
- H. If any overhead or underground power lines need to be de-energized, the Contractor shall call the electric company to do this work. Any cost associated with de-energizing the power line and/or any other protective measures required shall be at the Contractor's expense.

- I. All lighting poles, fixtures, and arms which are removed with this project shall be delivered to the City of Frisco Public Works facility (11300 Research Road, Frisco, Texas 75034) by the Contractor and will remain the property of the City of Frisco.
- J. Texas State Law, Article 1436C, makes unlawful the operation of equipment or machines within 10-feet of any overhead electrical lines under danger against contact with high voltage overhead lines has been effectively guarded against pursuant to the provisions of the article. When construction operations require working near an overhead electrical line, the Contractor shall contact the owner/operator of the overhead electrical line to make adequate arrangements and to take necessary safety precautions to ensure that all laws, electrical line owner/operator requirements and standard industry safety practices are met.
- K. All materials and construction methods shall be in accordance with the details shown on the plans, the requirements of this Item and the pertinent requirements of the following items:
 - a. TxDOT Item 616 "Performance Testing of Lighting Systems"
 - b. TxDOT Item 620 "Electrical Conductors"

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a per Each (EA) basis, complete in place.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Luminaire Pole." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work.
- B. Foundations shall be paid for once regardless of extra work caused by obstructions.

END OF SECTION

SECTION 265620**LUMINAIRE FIXTURE****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Luminaire Fixtures for City of Frisco standard street lighting.

1.02 REFERENCES

- A. Manufacturer's Standard Details and Specifications for Luminaire Fixture.

1.03 RELATED SECTIONS

- A. Section 265619 – Luminaire Pole
- B. Section 033101 – Drilled Shaft Foundation
- C. Section 347113 – Barricades, Signs, and Traffic Handling
- D. Section 260500 – Electric Conductor
- E. Section 344135 – Ground Box
- F. Section 260501 – Electrical Service

1.04 SUBMITTALS

- A. Manufacturer's Standard Details and Specifications.
- B. The Contractor shall furnish four (4) sets of submittals of the aluminum decorative fixture to the City. These submittals shall be approved by the City before the Contractor begins work.
- C. Prior to beginning fabrication, two (2) copies of the completed material identification form shall be furnished to the City.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials furnished by the Contractor shall be new, UL-listed, meet NEMA, NEC, AASHTO, and the Electrical Detail standard sheet requirements.
- B. Contractor shall provide luminaire fixtures. The luminaire fixture shall be a Hadco Profiler PA31 Series or Kim Archetype AR Series or approved equal and operate at 480 volts. Luminaire optics will produce an IESNA cutoff light distribution type as noted on the plans. Luminaire shall be 8 inches high by 33.75 inches in width with a housing made of low-copper die-cast aluminum alloy. Luminaire shall be able to mount on 2 3/8 inch OD bracket arm. Finish shall be electrostatically applied thermoset polyester powdercoat color Traffic Black (RAL9017).

- C. Contractor shall provide luminaire fixtures. Unless otherwise noted in the plans, luminaire fixtures shall be either:
 - 1. KIM Lighting Catalog No. *2B/ARX/250PMH480/BL-P/HSF*
 - 2. HADCO C1210D LUMINAIRE (BLACK, TYPE X, 250W PMH, 480V)
- D. Covers for the luminaire fixtures shall be a clear flat-glass insert.
- E. The ballast shall be core and coil pulse start metal halide designed to operate 250 watt pulse start metal halide lamps with 480 line volts.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to City of Frisco's General Notes for Traffic Signals and Street Lighting.
- B. All materials and construction methods shall be in accordance with the details shown on the plans, the requirements of this Item and the pertinent requirements of the following items:
 - a. TxDOT Item 616 "Performance Testing of Lighting Systems"
 - b. TxDOT Item 620 "Electrical Conductors"

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a per Each (EA) basis, complete in place.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Luminaire Fixture." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work.

END OF SECTION

DIVISION 31
EARTHWORK

31 05 13 SOILS FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

- A. This Section of the specifications describes the various classes of Earth Fill. All of the classes of Earth Fill contained in this specification may not be used on this project. The classes of Earth Fill used on this project are shown on the drawings or specified in other sections of the specifications. This Section does not include specifications for placement and compaction of Earth Fill. Specifications for placement and compaction of Earth Fill are included in other sections of the specifications and/or shown on the drawings.

1.02 STANDARDS

- A. Soil materials shall be classified into the appropriate class of Earth Fill shown below according to ASTM D2487 "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)" or other appropriate methods as designated by the Engineer.

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Earth Fill: Limited to clays and sandy clays classified as CH material with a liquid limit greater than or equal to 50, a plasticity index greater than or equal to 25, and a minimum of 60 percent passing the No. 200 sieve, which are free of organic materials.
- B. Class 2 Earth Fill: Limited to clays and sandy clays classified as CH and CL materials with a coefficient of permeability less than or equal to 1.0×10^{-7} cm/sec, a liquid limit greater than or equal to 30, a plasticity index greater than or equal to 15, and more than 50 percent passing the No. 200 sieve, which are free of organic materials.
- C. Class 3 Earth Fill: Consist of any materials classified as CH, CL, SM, SP, SP-SM, SC, and GC, which have a minimum plasticity index of 4, which are free of organic materials.
- D. Class 4 Earth Fill: Consist of materials which are classified as SP, SM, SC, CL, or dual classifications thereof, which have a liquid limit less than or equal to 35 and a plasticity index of a minimum of 4 and a maximum of 15, which are free of organic materials.
- E. Class 5 Earth Fill: Consist of materials classified as SP or SP-SM which have a plasticity index less than or equal to 4 and a maximum of 12 percent passing the No. 200 sieve, which are free of organic materials.
- F. Class 12 Earth Fill: Consist of soils suitable for topsoil which are relatively free of stones or other objectionable debris, which have sufficient humus content to readily support vegetative growth. The suitability of soils for topsoil shall be subject to the approval of the Engineer.

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

31 05 16 AGGREGATES FOR EARTHWORK

1.00 GENERAL

1.01 WORK INCLUDED

A. This Section of the specifications describes the various classes of Aggregate Fill. All of the classes of Aggregate Fill contained in this specification may not be used on this project. The classes of Aggregate Fill used on this project are shown on the drawings or specified in other sections of the specifications. This Section does not include installation. Installation of Aggregate Fill is included in other sections of the specifications and/or on the drawings.

1.02 QUALITY ASSURANCE

- A. Classification Testing:
 - 1. Contractor Testing:
 - a. Arrange and pay for the services of an independent testing laboratory to sample and test proposed Aggregate Fill materials.
 - b. Submit the test results to the Engineer, and obtain approval prior to providing Aggregate Fill.
 - 2. Owner Testing: The Owner shall arrange and pay for additional testing on the Aggregate Fill after delivery to the project site as determined necessary by the Engineer.
- B. Contamination Certification:
 - 1. Obtain a written, notarized certification from the Supplier of each proposed Aggregate Fill source stating that to the best of the Supplier’s knowledge and belief there has never been contamination of the source with hazardous or toxic materials.
 - 2. Submit these certifications to the Engineer prior to proceeding to furnish Aggregate Fill to the site. The lack of such certification on a potential Aggregate Fill source shall be cause for rejection of that source.

1.03 STANDARDS

- A. Aggregate Fill shall be classified into the appropriate class listed below according to ASTM testing procedures as specified for the various classes.
 - 1. American Society for Testing and Materials (ASTM) Standards:

ASTM C33	Specification for Concrete Aggregates
ASTM C88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium sulfate
ASTM C125	Terminology Relating to Concrete and Concrete Aggregates
ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D448	Classification for Sizes of Aggregate for Road and Bridge Construction

2.00 PRODUCTS

2.01 MATERIALS; CLASSIFICATIONS

- A. Class 1 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 57:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	95-100
1/2"	25-60
No. 4	0-10
No. 8	0-5

- B. Class 2 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 67:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

- C. Class 3 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 7:

Sieve Size Square Opening	Percent Passing
3/4"	100

1/2"	90-100
3/8"	40-70
No. 4	0-15
No. 8	0-5

- D. Class 4 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 467:

Sieve Size Square Opening	Percent Passing
2"	100
1-1/2"	95-100
3/4"	35-70
3/8"	10-30
No. 4	0-5

- E. Class 5 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 357:

Sieve Size Square Opening	Percent Passing
2-1/2"	100
2"	95-100
1"	35-70
1/2"	10-30
No. 4	0-5

- F. Class 6 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 1:

Sieve Size Square Opening	Percent Passing
4"	100
3-1/2"	90-100
2-1/2"	25-60
1-1/2"	0-15
3/4"	0-5

- G. Class 7 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 6:

Sieve Size Square Opening	Percent Passing
1"	100
3/4"	90-100
1/2"	20-55
3/8"	0-15
No. 4	0-5

- H. Class 8 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable materials and shall have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation in accordance with ASTM D448, size number 56:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	90-100
3/4"	40-85
1/2"	10-40
3/8"	0-15
No. 4	0-5

- I. Class 9 Aggregate Fill:

1. Consist of washed and screened gravel and natural sands or sands manufactured by crushing stones complying with the requirements of ASTM C33, except that the gradation shall be as follows:

Sieve Size Square Opening	Percent Passing
1/2"	100
3/8"	95-100
No. 4	80-95
No. 8	65-85
No. 16	50-75
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 9 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

J. Class 10 Aggregate Fill:

1. Consist of washed and screened natural sands or sands manufactured by crushing stones complying with the requirements and tests of ASTM C33. The gradation as included in ASTM C33 is as follows:

Sieve Size Square Opening	Percent Passing
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	0-10

2. Class 10 Aggregate Fill shall have not more than 45 percent passing any sieve and retained on the next consecutive sieve of those shown above, and its fineness modulus, as defined in ASTM C125, shall be not less than 2.3 nor more than 3.1.

- K. Class 11 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90
3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-12 (Wet Sieve Method)

- L. Class 12 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-12 (Wet Sieve Method)

- M. Class 13 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and shall meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-3/4"	100
7/8"	65-90
3/8"	50-70
No. 4	35-55
No. 40	15-30
No. 100	0-3 (Wet Sieve Method)

- N. Class 14 Aggregate Fill: Consist of durable particles of crushed stone free of silt, clay, or other unsuitable material and have a percentage of wear of not more than 40 percent when tested in accordance with ASTM C131 or C535. When material is subjected to five cycles of the sodium sulfate soundness test in accordance with ASTM C88, Sodium Sulfate Solution, the weighted percentage of loss shall not exceed 12 percent. The source of the material shall be approved by the Engineer and meet the following gradation:

Sieve Size Square Opening	Percent Passing
1-1/2"	100
1"	85-100
3/4"	60-95
3/8"	50-80
No. 4	40-65
No. 16	20-40
No. 100	0-3 (Wet Sieve Method)

- O. Class 15 Aggregate Fill: Consist of durable particles of silica sand, washed clean, chemically inert, and packaged by the Supplier. The material shall meet applicable regulatory requirements for monitor well filter pack. The source of the material shall be approved by the Engineer and shall meet the following gradation requirements:

Sieve Size Square Opening	Percent Passing
No. 20	98-100
No. 40	0-2

3.00 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 312316**EXCAVATION (ROADWAY)****PART 1 – GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Excavation (Roadway) in accordance with Texas Department of Transportation *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges* Item 110..

1.02 REFERENCES

- A. TxDOT Item 110.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 110.2.
- B. All excavation shall be unclassified, and shall include the removal of all materials encountered, regardless of their nature or the manner in which they are removed.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to TxDOT Item 110.2
- B. Frequency of compaction testing shall not exceed one test for every three hundred linear feet 300' spacing or less, alternating from left quarter point to center line to right quarter point of the cross section width.
- C. For density and moisture requirements of moisture treated excavation areas see Section 32112 Moisture Treated Subgrade.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to TxDOT Item 110.3 or as indicated in the Contract Documents.
- B. The plan quantity will be determined through calculations and will be used for determining final quantity amounts for payment purposes. Contract adjustments may be made if the actual measured quantity varies by more or less than 5% of the total estimated plan quantity amount. Either the City or the Contractor may initiate this adjustment. If the adjustment is requested by the Contractor, the Contractor must obtain field measurements and calculations justifying

the revised quantity. If the adjustment is made by the City, the revised quantity will constitute the final quantity for which payment will be made.

4.02 PAYMENT

A. Refer to TxDOT Item 110.4 or as indicated in the Contract Documents.

END OF SECTION

SECTION 312323

SELECT FILL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to install Select Fill in accordance with Texas Department of Transportation *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges* Item 132.

1.02 REFERENCES

- A. TxDOT Item 132.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 132.2 Type A.
- B. Eagle Ford may not be imported to other areas.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 132.3.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall not be measured as a separate contract Item unless noted otherwise.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items unless noted otherwise.

END OF SECTION

SECTION 312413**EMBANKMENT****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Embankment in accordance with Texas Department of Transportation *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges* Item 132.

1.02 REFERENCES

- A. TxDOT Item 132.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 132.2 and as specified in the Contract Documents.
- B. Eagle Ford may not be imported to other areas.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to TxDOT Item 132.3.
- B. Frequency of compaction testing shall not exceed one test for every three hundred linear feet 300' spacing or less ,alternating from left quarter point to center line to right quarter point for every layer of embankment.
- C. For density and moisture requirements of moisture treated embankments see Section 32112 Moisture Treated Subgrade.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Embankment will be measured by the cubic yard. The cubic yard will be measured in its final position using the average end area method. The volume is computed between the original ground surface or the surface upon which the embankment is to be constructed and the lines, grades, and slopes of the embankment. Shrinkage or swell factors will not be considered in determining the calculated quantities.
- B. The plan quantity will be determined through calculations and will be used for determining final quantity amounts for payment purposes. Contract adjustments may be made if the actual measured quantity varies by more or less than 5% of the total estimated plan quantity amount. Either the City or the Contractor may initiate this adjustment. If the adjustment is requested

by the Contractor, the Contractor must obtain field measurements and calculations justifying the revised quantity. If the adjustment is made by the City, the revised quantity will constitute the final quantity which payment will be made.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will be measured as provided for at the unit price bid for "EMBANKMENT" of the compaction method and type specified. The price is full compensation for furnishing embankment; hauling; placing, compacting, finishing, and reworking; disposal of waste material; and equipment, labor, tools, and incidentals.
- B. No separate pay for sprinkling, rolling (including proof rolling).
- C. Correction of soft spots in the subgrade will be at the Contractor's expense.

END OF SECTION

SECTION 312500**TEMPORARY EROSION, SEDIMENTATION, AND
WATER POLLUTION PREVENTION AND CONTROL****PART 1 – GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish, install, maintain and remove Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201

1.03 SUBMITTALS

- A. The Contractor must provide a separate Storm Water Pollution Prevention Plan (SW3P) before the Notice to Proceed will be issued. The Erosion Control Plans included in the plans will not be considered a SW3P. The SW3P shall comply with the regulations established by the Texas Commission on Environmental Quality (TCEQ).
- B. The Contractor is required to submit all appropriate forms and pay all fees, including the NOI and NOT, as well as producing and submitting all inspection reports through the duration, as required, to the TCEQ and the City. The Contractor will be responsible for submitting all required forms and fees on behalf of the City, and shall submit two (2) copies of all NOIs and proof of payment to the City prior to Notice to Proceed is issued.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201.
- B. Where existing grasses are disturbed, restoration shall consist of equal or better permanent vegetation. Provide a minimum of eight feet (8') of the appropriate seasonal seeded Curlex adjacent to all street and fire lane curbs and four feet (4') adjacent to alleys. The use of innovative products is encouraged, such as those made with composting materials, as long as they are approved by the Director of Engineering Services and permanent vegetative stabilization is established.
- C. Twenty four (24") to thirty six (36") inches in width of rock riprap shall be placed along the top and sides of the ground interface with all headwalls and end sections and street, alley, and fire lane stub outs.

2.02 EQUIPMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201.

4.02 PAYMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 201.

B. Payment for the preparation of a Storm Water Pollution Prevention Plan shall be paid under the line item – “Storm Water Pollution Prevention Plan.”

END OF SECTION

DIVISION 32
EXTERIOR IMPROVEMENTS

SECTION 321116

FLEXIBLE SUBBASE OR BASE (CRUSHED STONE/CONCRETE)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Flexible Subbase or Base (crushed stone/concrete) in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1 and 301.5.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1 and 301.5

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1 and 301.5.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301. And 301.5.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1 and 301.5.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1 and 301.5.

END OF SECTION

SECTION 321123

SAND BEDDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to install Sand Bedding in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall not be measured as a separate contract Item unless otherwise noted.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

END OF SECTION

SECTION 321313**CONCRETE PAVEMENT****PART 1 – GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Concrete Pavement in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303
- B. City of Frisco Standard Details for Concrete Pavement

1.03 SUBMITTALS

- A. Submit mix design for each class of concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 303.2 and 303.3.
- B. All concrete shall be sulfate resistant mix design.
- C. Specified reinforcing steel (#4 bars and larger) shall be of domestic manufacture and shall conform to the requirements of ASTM A615, Grade 60.
- D. Grade 40 reinforcing steel (#3 bars) will only be allowed in sidewalks or with approval of the Director of Engineering Services.
- E. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 303.2.2 is hereby modified to allow only Type I/II Portland Cement.
- F. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 303.2.4 is hereby modified to allow only Class F flyash.
- G. Expansion joints in paving shall be redwood boards only.

2.02 EQUIPMENT

- H. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.4.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 303.5. and 303.8. Samples of all materials for testing shall be solely the responsibility and expense of the Contractor.
- B. Conform to City of Frisco's Standard Details for Concrete Pavement.
- C. Slip form pavement method shall be used for all public streets and alleys unless otherwise approved by the Director of Engineering Services. Hand formed pavement method may be used for turn lanes, deceleration lanes, driveway approach, or replacing a panel of public street or alley pavement.
- D. Curb shall be cast integral with paving unless otherwise approved by the City.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.9.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.9.
- B. Monolithic curb shall be considered incidental to the work performed and materials furnished in accordance with this Item, and will not be paid for directly but will be subsidiary to Concrete Pavement unless otherwise specified in the plans and in the bid proposal.

END OF SECTION

SECTION 321314

ROLLING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary for Rolling in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1.2.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 301.1.2

PART 2 - PRODUCTS

2.01 MATERIALS

A. TAMPING ROLLER

1. Tamping rollers shall consist of two (2) metal rollers, drums or shells of not less than forty inches (40") in diameter, each not less than forty-two inches (42") in length and unit mounted in a rigid frame in such a manner that each roller may oscillate independently of another. Each roller, drum or shell shall be surmounted by metal studs with tamping feet projecting not less than seven inches (7") from the surface and spaced not less than six inches (6") nor more than 10 inches (10") measured diagonally center to center; and the cross-sectional area of each tamping foot measured perpendicular to the axis of the stud, shall be not less than five square inches (5") nor more than eight square inches (8"). The roller shall be of the type that by ballast loading, the load on each tamping foot may be varied uniformly from 125 p.s.i. of cross-sectional area. The load per tamping foot will be determined by dividing the total weight of the roller by the number of tamping feet in one row parallel to or approximately parallel to the axis of the roller.
2. The tamping roller shall be drawn by approved equipment of adequate tractive effort. Power equipment used in embankment construction shall be the crawler type tractor. Two (2) tamping rollers conforming to the above requirements, drawn by approved equipment, shall be considered a roller unit.

B. TIRE ROLLER

1. Tire rollers shall consist of not less than nine (9) pneumatic-tired wheels, running on axles in such a manner that the rear group of tires will not follow in the tracks of the forward group of wheels, and mounted in a rigid frame, and shall be of a type suitable for ballast loading. The distance between the front and rear axles shall be not less than five feet (5') no more than 10 feet (10').
2. The front axle shall be attached to the frame in such a manner that the roller may be turned in a minimum circle. The pneumatic tire roller shall have an effective rolling width of approximately sixty inches (60"), and shall be ballast loaded so that the load may be varied uniformly from not less than 100 p.s.i. of width of tire tread to 325 pounds per inch of tire tread. The roller, under working conditions, shall provide a uniform compression under all wheels. The total combined width of effective tire tread shall be not less than eighty-five percent (85%) of the effective rolling width. The pneumatic tire

roller shall be drawn by either an approved crawler type, a pneumatic tread tractor, or a truck of adequate tractive effort; and the roller when drawn by either type of equipment shall be considered a pneumatic tire roller unit. Power equipment for rolling on asphalt shall be equipped with pneumatic tires.

PART 3 - EXECUTION

3.01 PREPARATION

- A. The embankment or base course shall start longitudinally at the sides and proceed toward the center, overlapping on successive trips at least one-half (1/2) of the width of the pneumatic tire roller unit. Alternate trips of the roller unit shall begin at the low sides and progress toward the high sides.
- B. The speed of the power roller and the tamping roller unit, unless otherwise directed by the City, shall be between two (2) and three (3) miles per hour. The speed of the pneumatic tire unit, unless otherwise directed by the City, shall be between four (4) and twelve (12) miles per hour for asphalt surfacing work and between two (2) and six (6) miles per hour for all other compaction work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall not be measured as a separate contract Item.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

END OF SECTION

SECTION 321373

JOINT SEALANT

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary for Joint Sealant in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.5.4.7.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2 and 303.5

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.2.12.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.5.4.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall not be measured as a separate contract Item.

4.02 PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

END OF SECTION

SECTION 321613

CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Concrete Curb and Gutter in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 305.1.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 203.4, 303 and 305.1
- B. City of Frisco's Standard Detail for Concrete Curb and Gutter.

1.03 RELATED SECTIONS

- A. Section 321313 – Concrete Pavement

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 303.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 203.4 and 305.1.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Concrete Curb and Gutter will not be measured separately unless indicated otherwise.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Concrete Curb and Gutter". This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work.

END OF SECTION

SECTION 321660

CONCRETE MEDIAN NOSE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Concrete Median Noses in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 305.3.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 305.1, and 305.3.
- B. City of Frisco’s Standard Detail for Monolithic Median Nose

1.03 RELATED SECTIONS

- A. Section 032100 – Reinforcing Steel
- B. Section 311313 – Concrete Pavement

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 305.3.
- B. All median noses shall be monolithic in accordance with the City of Frisco’s Standard Detail for Concrete Median Nose.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 305.3.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a per Each (EA) basis, specified by Type (1 or 2), complete in place.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Concrete Median Nose." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work. Concrete Pavers within the medians shall be paid for separately.

END OF SECTION

SECTION 321723**PAVEMENT MARKERS AND MARKINGS****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Pavement Markers and Markings.

1.02 REFERENCES

- A. TxDOT Items 666, 672, 677, and 678
- B. City of Frisco's Standard Details for Pavement Markers and Markings.
- C. TxDOT Standard Details included in the plans.

1.03 RELATED SECTIONS

- A. Section 347113 – Barricades, Signs, and Traffic Handling

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 666, 672, 677, and 678.
- B. Refer to the City of Frisco's Standard Details for Pavement Markers and Markings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 666, 672, 677, and 678.
- B. Each class of raised pavement marker shall be from the same manufacturer.
- C. Contact City for approval of pavement marking layouts prior to installation.
- D. Surface to which markers are to be attached by an adhesive shall be prepared by any method approved by the City to ensure that the surface is free of dirt, curing compound, grease, oil, moisture, loose or unsound pavement markings and any other material which would adversely affect the adhesive bond.
- E. Guides to mark the lateral location of pavement markings shall be established as shown on the plans. The Contractor shall establish the pavement marking guides and the City will verify the location of the guides.
- F. The pavement markers shall be placed in proper alignment with the guides. The deviation rate in alignment shall not exceed one (1) inch per 200 feet of roadway. The maximum deviation shall not exceed two (2) inches nor shall any deviation be abrupt.

- G. Markers placed that are not in alignment of sequence, as shown on the plans or as stated in this specification, shall be removed by the Contractor at the Contractor's expense. Removal shall be in accordance with TxDOT Item 677 "Eliminating Existing Pavement Markings and Marker", except for measurement and payment. Guides placed on the roadway for alignment purposes shall not establish a permanent marking on the roadway.
- H. Unless otherwise shown on the plans, the Contractor shall use the following adhesive materials for placement of markers:
 - 1. Epoxy adhesive for Class E markers.
 - 2. Bituminous adhesive for Classes A, B, C, and D markers on bituminous pavements.
 - 3. Epoxy adhesive for Class A, B, C, and D markers on Portland cement concrete pavements.
- I. Adhesive shall be applied in sufficient quantity to ensure that 100 percent of the bonding area of the raised pavement markers shall be in contact with the adhesive.
- J. Raised pavement markers, except Class E, shall be in contact with the pavement surface but shall be seated on a continuous layer of adhesive.
- K. Unless otherwise noted, adhesives shall be applied in accordance with the manufacturer's recommendations.
- L. When bituminous adhesive is used, pavement and raised pavement marker temperature shall be at least 40 degree F. The bituminous adhesive shall not be heated above 400 degree F. The bituminous adhesive shall be agitated intermittently to ensure even heat distribution.
- M. Epoxy adhesive shall be machine mixed.
- N. Raised pavement markers shall be free of rust, scale, dirt, oil, grease, moisture, or contaminants which may adversely affect the adhesive bond.
- O. Raised pavement markers shall be placed immediately after the adhesive is applied and shall be firmly bonded to the pavement. Adhesive or any other material that impairs functional reflectivity will not be acceptable.
- P. The roadway to be marked will remain open to traffic and the Contractor shall provide all necessary warning and barricading to insure the safety of the workmen and traffic, and the Contractor must insure proper maintenance of all warning and barricading devices at all times. Construction, signing, channelizing devices, and markings shall conform to the current *Texas Manual on Uniform Traffic Control Devices (TMUTCD)* at all times.
- Q. A minimum of one lane in each direction shall remain open to through traffic at all times.
- R. The Contractor shall conduct the installation so as to minimize the duration of restricted traffic movements.
- S. The Contractor shall apply pavement markers and markings during off-peak traffic hours (9:00 am – 3:30 pm) or as directed by the City.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a Lump Sum (LS) basis complete in place or by Each (EA) and Linear Foot (LF) as indicated in the plans.
- B. The plan quantity will be determined through calculations and will be used for determining final quantity amounts for payment purposes. Contract adjustments may be made if the actual measured quantity varies by more or less than 5% of the total estimated plan quantity amount. Either the City or the Contractor may initiate this adjustment. If the adjustment is requested by the Contractor, the Contractor must obtain field measurements and calculations justifying the revised quantity. If the adjustment is made by the City, the revised quantity will constitute the final quantity which payment will be made.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Pavement Markers and Markings." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work. Surface Preparation will not be paid for directly, but considered subsidiary to this Item.

END OF SECTION

SECTION 321725

PREFABRICATED PAVEMENT MARKINGS (WITH WARRANTY)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Prefabricated Pavement Markings as indicated in the plans with a manufacturer's warranty bond for a 6 year period. The City will allow a Contractor provided warranty bond in lieu of the manufacturer's bond if all conditions of the manufacturer's warranty including the requirements of this Item are met. In such case, the Contractor is responsible for meeting the warranty requirements. Use the form provided by the City. The City will allow substitution of a contractor's bond with a manufacturer's bond after execution of the Contract prior to final acceptance.

1.02 REFERENCES.

- A. City of Frisco's Standard Details for Pavement Markers and Markings.

1.03 RELATED SECTIONS

- A. Section 347113 – Barricades, Signs, and Traffic Handling

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Contractor shall use 3M 270 Tape (or approved equal) for all directional arrows and messages, and 3M 380 Tape for all longitudinal pavement markings and 12" channelization lines as indicated in the plan. Approved equal pavement markings must meet the TxDOT requirements of Type B markings in DMS-8240.

2.02 EQUIPMENT

- A. Provide equipment as required or directed according to the following (The provider of the warranty bond is responsible for providing equipment during the warranty period unless otherwise shown on the plans.):
1. Preparation and Application. Use equipment designed for the pavement preparation and application of the type of pavement marking material selected.
 2. Colorimeter. Provide a colorimeter using 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle meeting the requirements of ASTM E 1347, E 1348, or E 1349.
 3. Retroreflectometer. Unless otherwise shown on the plans, provide a portable or mobile retroreflectometer meeting the following requirements.
 - a. Portable Retroreflectometer. Provide a portable retroreflectometer that meets the requirements of ASTM E 1710

- b. Mobile Retroreflector. Provide a mobile retroreflector that:
- (1) is approved by the City and certified by the Texas Transportation Institute Mobile Retroreflector Certification Program for project evaluation of retroreflectivity
 - (2) is calibrated daily, before measuring retroreflectivity on any pavement stripe, with a portable retroreflector meeting the following requirements: ASTM E 1710, entrance angle of 88.76°, observation angle of 1.05°, and an accuracy of ±15%;
 - (3) requires no traffic control when retroreflectivity measurements are taken and is capable of taking continuous readings at or near posted speed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Contractor to ensure a manufacturer's representative is present during installation of all pavement markings
- B. Prepare the pavement surface using controlled techniques that minimize pavement damage and hazards to the traveling public. Apply the materials, according to the manufacturer's recommendations, using widths, colors, shapes, and at locations as shown on the plans.
- C. Obtain approval for the sequence of work and estimated daily production. Use traffic control as shown on the plans or as approved. Establish guides to mark the lateral location of pavement markings as shown on the plans or as directed, and have guide locations verified. Use material for guides that will not leave a permanent mark on the roadway. Apply markings in alignment with the guides and without deviating for the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum
- D. Remove all applied markings that are not in alignment or sequence as stated in the plans or as stated in the specifications at the Contractor's expense and in accordance with TxDOT Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment
- E. The City will conduct visual performance evaluations of the markings. For markings that do not meet the City's visual performance evaluation, the Contractor may present test results for color (using a colorimeter), retroreflectivity (using a retroreflector), and durability (in accordance with ASTM D 913) for the City's use in making acceptance or rejection decisions. For pavement markings not meeting performance requirements, repair or replace until reevaluation shows the Pavement Markings and Markings meet the performance requirements as approved by the City.
- F. Written Acceptance. The City will provide written acceptance after the Contractor meets the initial performance requirements. This written acceptance (see attached sample form) will include the date, location, length, and type of pavement markings.

3.02 PERFORMANCE REQUIREMENTS

- A. Color. Provide pavement markings consisting of pigments blended to provide color conforming to highway colors as shown in Table 1.

Table 1
Color Requirements

Federal 595 Color		Chromaticity Coordinates								Brightnes s (Y)
		1		2		3		4		
		x	y	x	y	X	y	x	y	
White	17855	.290	.315	.310	.295	.350	.340	.330	.360	60 min
Yellow	33538	.470	.455	.510	.489	.490	.432	.537	.462	30 min
Black										5 max

- B. Retroreflectivity. Provide pavement markings for longitudinal markings meeting the minimum retroreflectivity values listed in Table 2.

Table 2
Minimum Retroreflectivity Requirements

Color	Retroreflectivity, mcd/m ² /lx, Min
White	120
Yellow	120

- C. Durability. Provide pavement markings that do not lose more than 5% of the striping material in a 1,000- ft. section of continuous stripe or broken stripe (25 broken stripes). Pavement markings must remain in the proper alignment and location.
- D. Performance Evaluation Procedures. Provide traffic control and conduct evaluations of color, retroreflectivity, and durability as required or directed by the City.
- Color. Measure color using 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle in accordance with ASTM E 1347, E 1348, or E 1349.
 - Retroreflectivity. Unless otherwise shown on the plans, conduct retroreflectivity evaluations of pavement markings with either a portable or mobile retroreflectometer. Make all measurements in the direction of traffic flow, except for broken centerline on 2-way roadways, where measurements will be made in both directions.

If using a portable retroreflectometer, take a minimum of 1 measurement every mile on each series of markings (i.e., edgeline, center skipline, each line of a double line, etc.), at locations approved by the City. If more than 1 measurement is taken, average the measurements. For all markings measured in both directions, take a minimum of 1 measurement in each direction. If the measurement taken on a specific series of markings within each mile segment falls below the minimum retroreflectivity values, take a minimum of 5 more measurements at locations determined by the City within that mile segment for that series of marking. If the average of these 5 measurements falls below the minimum retroreflectivity requirements, that mile segment of the applied markings does not meet the performance requirement.

If using a mobile retroreflectometer, review the results to determine deficient sections and deficient areas of interest. These areas do not meet the performance requirements.

- Durability. Measure durability in accordance with ASTM D 913 for marking material loss and visual inspection for alignment and location. Conduct evaluations at locations approved by the City.

3.03 WARRANTY REQUIREMENTS

- A. Each warranty period is for 6 yr. and starts the day after written acceptance.
- B. The marking warrantor is responsible for meeting the Performance Requirements for the duration of the warranty period.
- C. During the warranty period, the City will conduct periodic visual performance evaluations of the pavement markings. For retroreflectivity the City will use Tex-828-B, "Determining Functional Characteristics of Pavement Markings." The warrantor may be present during these evaluations. For areas, which, in the opinion of the City have a questionable visual evaluation, the warrantor may replace the pavement markings or may conduct a performance evaluation for the performance requirement in question, conduct retroreflectivity evaluations using either portable or mobile retroreflectometer unless otherwise indicated in the Contract Documents. The warrantor is responsible for traffic control when conducting performance evaluations.
- D. The warrantor will replace pavement markings that fail to meet the color, retroreflectivity, or durability performance requirements during the warranty period, and must replace the pavement markings that fail to meet the performance requirements within 30 days of notification.
- E. All replacement pavement markings must meet the materials and performance requirements of this specification.
- F. The end of the warranty period does not relieve the warrantor from the performance deficiencies requiring corrective action identified during the warranty period.
- G. The City may exclude pavement markings from the replacement provisions of the warranty period, provided the City determines that the failure is a result of outside causes rather than defective material. Examples of outside causes are extreme wear at intersections, damage by snow or ice removal, and premature pavement failure.
- H. Provide a contact person, address and telephone number for notification of needed pavement markings replacement.
- I. Each class of raised pavement marker shall be from the same manufacturer.
- J. The pavement markers shall be placed in proper alignment with the guides. The deviation rate in alignment shall not exceed one (1) inch per 200 feet of roadway. The maximum deviation shall not exceed two (2) inches nor shall any deviation be abrupt.
- K. Unless otherwise noted, adhesives shall be applied in accordance with the manufacturer's recommendations.
- L. The roadway to be marked will remain open to traffic and the Contractor shall provide all necessary warning and barricading to insure the safety of the workmen and traffic, and the Contractor must insure proper maintenance of all warning and barricading devices at all times. Construction, signing, channelizing devices, and markings shall conform to the current *Texas Manual on Uniform Traffic Control Devices* (TMUTCD) at all times.
- M. A minimum of one lane in each direction shall remain open to through traffic at all times.
- N. The Contractor shall conduct the installation so as to minimize the duration of restricted traffic movements.
- O. The Contractor shall apply pavement markers and markings during off-peak traffic hours (9:00 am – 3:30 pm) or as directed by the City.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a Lump Sum (LS) basis complete in place or by Each (EA) and Linear Foot (LF) as indicated in the plans.
- B. The plan quantity will be determined through calculations and will be used for determining final quantity amounts for payment purposes. Contract adjustments may be made if the actual measured quantity varies by more or less than 5% of the total estimated plan quantity amount. Either the City or the Contractor may initiate this adjustment. If the adjustment is requested by the Contractor, the Contractor must obtain field measurements and calculations justifying the revised quantity. If the adjustment is made by the City, the revised quantity will constitute the final quantity which payment will be made.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for "Prefabricated Pavement Marking" of the color, shape, and width. This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work. Surface Preparation will not be paid for directly, but considered subsidiary to this Item.

END OF SECTION

32 84 23 LANDSCAPE IRRIGATION SYSTEMS

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide skilled labor, materials, and equipment for a complete operable landscape irrigation system as specified herein. Provide an Irrigation system designed by a licensed Landscape Irrigator for permitting as required by the AHJ.
- B. Provide a design and install an approved landscape irrigation system for trees, shrubs and turf as indicated on the landscape drawings, and as directed herein.
- C. Provide connections to city water mains, meters and backflow preventers as required by the Authority Having Jurisdiction (AHJ) (City of Frisco) and the TCEQ standards and regulations.
- D. Coordinate and pay for fees, taps and all other associated costs associated with new irrigation supply main installations prior to beginning construction. Include these costs in the original bid.
- E. Conform to TCEQ and the AHJ requirements for connections to reclaimed water supplies.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers.
 - 1. Manufacturers of irrigation specialties shall be experienced in the production of this type of equipment. Substitutions shall conform to Division 1.
 - 2. Recognized manufacturers are as follows:
 - a. Rain Bird Corporation.
 - b. Hunter Industries.
 - c. Weathermatic.
 - d. Leit DIG Corporation.
- B. Installer's Requirements.
 - 1. Contractors irrigators, technicians and installers shall be licensed by the Texas Commission on Environmental Quality (TCEQ) and remain in good standing throughout the project. At least one licensed landscape irrigator or technician shall be on the jobsite during construction at all times providing on-site supervision of the installation of the irrigation system and shall provide their TCEQ irrigators license card when requested by the OWNER, or Architect/Engineers (A/E) representative. Design of the

irrigation shall be performed by a licensed landscape irrigator, holding a current license in good standing by the TCEQ.

2. Install products in compliance with the recommendations of the manufacturer. DO NOT install products which are out of compliance with the manufacturers written recommendations without obtaining written consent from the A/E's licensed Irrigator prior to installation. Failure to comply may result in the contractor being required to remove and re-install systems or components at no additional cost to the Owner.
3. Design of the pipe system shall be based on a 5 feet per second (FPS) maximum velocity. The contractor shall replace piping which exceeds this velocity at his own expense.
4. The landscape irrigation contractor is required by this specification to provide a complete design and installation of the system where a complete design is not provided on the drawings, the requirements of the Texas Administrative Code, Title 30, ENVIRONMENTAL QUALITY; Chapter 344, LANDSCAPE IRRIGATION; shall be strictly complied with, including but not limited to Rule 344.61, as modified by the currently effective TCEQ rules.
5. Provide a manual drain valve at low points in mainline. Provide a turf box and a minimum of 10 lbs. of pea gravel at the base of the drain box.
6. Provide automatic drain valves for each Station. Provide a turf box and a minimum of 20 lbs. of pea gravel at the base of the drain box.
7. Provide ET Based weather station.
8. Irrigation system shall be compatible to and coordinated with new and existing landscape.
9. The installation of drip Irrigation systems shall comply with the manufacturer's requirements.
10. Provide approved manufacturers purple non-potable water markings on all pipe and components of this system.
11. Wiring of controllers, weather stations and valves shall comply with the manufacturer's instructions and the National Electric Code (NEC). Bury conductors to the weather station from the controller in rigid electrical conduit. Provide adequately selected and sized conductors (wiring), minimum of 14 gage wiring. Thermostat wire shall not be used for low voltage systems or valves.
12. Provide concrete thrust blocks or approved piping restraints on all pressure mains and piping exceeding 85psig at 90 degree elbows and bullhead tees.
13. Provide metal location tape affixed to on all piping in sleeves beneath concrete drives and walks. Provide threaded caps on both ends of sleeves installed for future use and include metal location tape. Extend sleeves a minimum of 12" beyond concrete on both sides.

14. Pipe and Poly tubing shall be buried beneath the compacted soil. Mulch layers are not acceptable bury material. Pipe and tubing shall be buried below the frost line and no shallower than 6 inches beneath compacted soil, or as otherwise recommended by the manufacturer.
15. Provide drip system indicator for each drip system zone/station.
16. Products of like nature shall be of the same manufacturer in the following categories:
 - a. Controllers.
 - b. Weather stations.
 - c. Valves.
 - d. Drip irrigations systems.
 - e. Drain valves.
 - f. Freeze, wind and rainstats.
 - g. Turf boxes, valve boxes and meter boxes.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Division 1, SUBMITTALS and shall include:

1. Manufacturer's product data for the following:
 - a. Controllers.
 - b. Drip irrigation systems.
 - c. Electric, manual valves and drain valves.
 - d. Weather Stations.
 - e. Pipe and fittings.
 - f. Wiring, watertight connectors, conduit, pull boxes.
 - g. Turf and valve vaults or boxes.
 - h. Backflow preventers.
 - i. Operation and Maintenance Manuals for all products.
 - j. ET Controller input data.

B. Shop drawings include the following:

1. A scale drawing (minimum 1" = 20'-0") indicating:
 - a. Drip irrigation systems.
 - b. Controller location, type and weather station input data.
 - c. Valve locations, with zone identification for electric globe valves.
 - d. Pipe (and sleeve) locations with sizes, provide flow capacities in gallons per minute (GPM) and velocities in feet per second (FPS) for all sprinkler pipe.
 - e. Weather Station locations with mounting details.
 - f. Wiring routing, details of wet connections in valve boxes.
 - g. Landscape features; e.g. trees, shrub and turfed areas, perennials and annual beds.
 - h. All site features affecting the irrigation system; e.g. transformers, walks, drives, structures, curbs, easements, utilities.
 - i. The direction of true north, and the prevailing wind in miles per hour.
- C. As-built drawings shall be true, scaled drawings with every deviation from the shop drawings legibly indicated, including all amendments, addendums and change orders. All pipe and main components shall be exactly to scale or dimensioned from a fixed measuring point.
- D. Provide a copy of the *current* TCEQ Irrigators License card for every person that will be on site or designing, installing or supervising the installation with the shop drawings.

1.04 STANDARDS AND REFERENCES

- A. Regulatory requirements.
 1. Comply with the regulations, codes and ordinances of the Authority Having Jurisdiction.
 2. All fees, permits and inspections shall be secured by and paid for by the contractor.
 3. Comply with the requirements of the Texas Administrative Code, Title 30. Part 1, Chapter 344, Subchapter D.
- B. References.

Materials and methods of the following referenced standards and specifications of the latest edition form a part of this specification section as applicable.

1. Manufacturers Standardization Society of the Valves and Fittings Industry (MSS) Standard.

2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. American Water Works Association (AWWA) Standards.

1.05 DELIVERY AND STORAGE

- A. Deliver manufactured products to the site in the original cartons or other protective coverings. Products shall remain packaged until ready for installation. Store piping on wood runners raised above grade. Security and protection from the elements are the contractor's responsibility. Protect ends of piping to prevent dirt and debris from entering throughout the installation.

1.06 JOB CONDITIONS

- A. Existing Utilities: Verify, on the jobsite, the exact location of all existing underground utilities before beginning construction. Contact the utility companies prior to excavation for line locations and notification. Hand excavate trenches and valve box vaults near existing utilities. Repair or pay for repairs to damaged utilities without cost to the Owner.
- B. System Layout: Layout the system prior to installation. Drive surveyor's flags or stakes in the ground to indicate the location of the major components of the system. Stakes or flags with color-coded tops shall be used to identify location of mains and risers. In the event that layout conflicts with trees or other obstructions, adjust as necessary. Remove all flags from the jobsite after installation is accepted.

1.07 GUARANTEES, OR WARRANTIES

- A. Materials, equipment and workmanship furnished under this contract shall be guaranteed for a period of one (1) year from the date of acceptance. The Installer is responsible to submit warranty cards to the manufacturers on the behalf of the Owner for products. Provide a copy of the warranty cards submitted with a certification that the cards and warranties have been submitted.
- B. The guaranty shall include but not be limited to the following:
 1. Materials and workmanship of the irrigation system.
 2. Compliance with the manufacturer's design and installation recommendations.
- C. Upon receipt of notice from the Owner or his authorized representative of failure of any part of the guaranteed equipment, material or workmanship during the guaranty period, the affected part or parts shall be replaced promptly with new parts, by and at the expense of the contractor. The contractor shall acknowledge his responsibility under these guaranty provisions by letter with the as built drawings, stating that the equipment, materials and workmanship referred to herein are guaranteed and stating the inclusive dates of the

guaranty period, and contact information for emergency repairs. The warranty period begins on the date of written acceptance of the irrigation system by the Owner, or their authorized representative.

- D. All work under this contract shall not be finally accepted until expiration of the guaranty period. During this period, the irrigation contractor is responsible for the work until final acceptance.

2.00 PRODUCTS

2.01 THE BASIS OF DESIGN (BOD) IS THE FIRST MANUFACTURER LISTED HEREINAFTER. APPROVED MANUFACTURERS ARE LISTED FOLLOWING. PROVIDE PRODUCTS EQUAL TO OR BETTER THAN THE BASIS OF DESIGN AND COMPLYING WITH THE AHJ'S REQUIREMENTS, FOR APPROVAL IN THE SUBMITTALS IN ACCORDANCE WITH DIVISION 1.

2.02 PIPE AND FITTINGS

A. General.

Pipe shall be permanently marked with the ASTM classification number, pipe size and manufacturer's name. Non-potable pipe and appurtenances shall have purple components.

B. PVC (polyvinyl chloride) pipe and fittings.

1. PVC Pipe up to 3" Diameter:

- a. PVC Pipe, Pressure Rated: ASTM D 2241, PVC 1120 compound, SDR 21 and SDR 26. PVC Socket Fittings: ASTM D 2467, Schedule 80.
- b. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2. PVC Pipe 3" Diameter and above:

- a. C900 Class 200 (DR-14), rated at 200 PSI, conforming to the dimensions and tolerances established by AWWA C900 and DR-14 requirements. Use purple colored pipe, Pantone 522 embossed or integrally stamped/marked "CAUTION RECLAIMED WATER DO NOT DRINK". Pipe may also be installed with a purple identification tape, or a purple polyethylene vinyl wrap, color to be Pantone 512. Use rubber-gasketed pipe equipped with factory installed reinforced gaskets. Gasketed pipe joints must conform to the "Laboratory Qualifying Tests" section of ASTM D3139. Gasket material must conform to ASTM F477. Use rubber-gasketed mechanical joint ductile iron fittings conforming to ASTM A-536 and ASTM F-477. Use lubricant approved by the pipe manufacturer. Elastomeric-Gasket Joint: Pipe shall be to dimensional requirements of ASTM D 1785/2665, Schedule 40 with joints meeting the requirements of 150 psi working pressure, 200 hydrostatic test pressure, unless

otherwise shown or specified, or it may be pipe conforming to requirements of ASTM D 2241, elastomeric joint.

- C. PVC cement Joints shall be made up using purple primer and clear solvent cement meeting the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2588 and manufacturers recommendations.

2.03 BACKFLOW PREVENTERS

- A. Provide Backflow preventers in accordance with the AHJ requirements of the project; manufacturers of acceptable products follow.
- B. Double Check Backflow Preventers:
 - 1. Double check backflow preventer (DCV) 2" and smaller: ANSI/ASSE 1015; complete unit of two independently acting check valves, two ball valves, strainer and four test cocks, bronze or iron body with bronze internal parts, 150 psi working pressure, and shall comply with AWWA Standard C506.

Acceptable Manufacturers and models:

Cla-Val Co: D-2 (1-1/2" & smaller).

Watts: 700 or 757 series.

Hersey: FDC.

Febco: 805Y.

Wilkins: 550.

- 2. Double check backflow preventer 2-1/2 inches and larger: ANSI/ASSE 1015; complete unit of two independently acting check valves, two ball gate valves, and four test cocks, bronze or iron body with bronze internal parts, 150 psi working pressure, and shall comply with AWWA Standard C506.

a. Acceptable manufacturers and models:

1). Cla Val Co.: D (2" and larger).

2). Watts: 700.

3). Hersey: 2.

4). Febco: 805Y.

5). Wilkins: 550.

- C. Reduced Pressure Principle:

1. Reduced pressure backflow preventer 2 inches and smaller: ANSI/ASSE1013; complete unit of two independently acting check valves together with an automatically operating pressure relief valve, two ball valves, strainer, and four test cocks, bronze or iron body with bronze internal parts, 150 psi working pressure, and shall comply with AWWA Standard C506.
 - a. Acceptable manufacturers and models:
 - 1). Cla Val Co.: RP-2 (2" and smaller).
 - 2). Watts: 900.
 - 3). Hersey: FRP-II.
 - 4). Febco: 825Y.
 - 5). Wilkins: 575.
2. Reduced pressure principle (RPZ) backflow preventer 2-1/2 inches and larger: ANSI/ASSE 1013; complete unit of two independently acting check valves together with an automatically operating pressure relief valve, two gate valves, and four test cocks, bronze or iron body with bronze internal parts, 150 psi working pressure, and shall comply with AWWA Standard C506.
 - a. Acceptable manufacturers and models:
 - 1). Cla Val Co.: RP-1 (2" and larger).
 - 2). Watts: 900.
 - 3). Hersey: 6CM.
 - 4). Febco: 825.
3. Pressure vacuum breaker.
 - a. Acceptable manufacturers and models:
 - 1). Cla Val Co.: RP-1 (2" and larger).
 - 2). Watts: 900.
 - 3). Hersey: 6CM.
 - 4). Febco: 825.
 - 5). Wilkins: 575.

2.04 VALVES

A. Ball Valves.

1. Ball Valves 2" And Less: rated 150 PSIG, PVC Type 1, with EPDM O rings, Single Union serviceable type, Made in the USA,

- a. Acceptable manufacturers:

- 1). NDS.
- 2). Apollo.
- 3). American Valve.

B. Control Valves (zone valves).

1. Control (zone) valves for irrigation systems: Glass-filled poly-propylene body cover with stainless steel spring and nylon exhaust fitting. Diaphragm shall be nylon reinforced Buna N molded with heavy Buna N seat to form an integral unit. Valve shall be packless, with bolted (stainless steel bolts) top. Design shall be "normally-closed", requiring solenoid to be energized to open valve, with automatic closure in event of power failure. Solenoid shall comply with Class II National Electric Code and when operating require a maximum of 0.23 amperes, 3.0 watts at 24 volts A.C. Solenoid shall be integrally mounted in valve cover and molded in epoxy to form a corrosion and moisture-proof unit with exposed metal components of non-corrosive material. Flow control shall be brass with O-ring seal and adjustable from outside the valve for permanent throttling or complete closing of valve.

- a. Acceptable manufacturers and models:

- 1). RainBird: PESB with DIG LEIT adapters.
- 2). DIG: LEMA.
- 3). Hunter.
- 4). Weathermatic.

2.05 DRIP IRRIGATION SYSTEMS

A. Provide drip irrigation from an approved manufacturer to include:

1. RainBird.
2. Hunter.
3. Weathermatic.
4. Netafim.

- B. BOD is RainBird, Low volume dripline irrigation products including Control Zone Kits, XFS Dripline, compatible fittings, Pressure Regulating Quick Check Basket Filter and Low Volume Emission Devices, indicators.
- A. Control zone kit assemblies for dripline irrigation zones must include control valve, filtration, and pressure regulation components sized to meet the hydraulic demands and flow requirements of the zones that they service.
- B. RainBird XFS Sub-Surface Copper-Colored Dripline with Copper Shield™ Technology and pressure-compensating inline emitters.
 - 1. RainBird XFS Sub-Surface Purple Dripline model numbers for NON-POTABLE water systems; dual layered, tubing with emitter flow rates and spacing as recommended by manufacturer.
 - 2. Acceptable manufacturers and models:
 - a. RainBird: XFS-P-04-12-500.
 - b. Netafim.
 - c. Hunter.

2.06 CONTROLLER – ELETRICAL POWERED, STANDARD PROGRAMMING

- A. Controller – Ambient light sensing or solar powered
 - 1. Programmable, self-contained, advance ambient light powered water-management irrigation controller. Weather based wireless, to include DIGS LEIT WWS system. Non-volatile memory, liquid crystal display, power provided by an internal, ultrahigh efficiency photovoltaic module and microelectronic energy management system fueled by ambient light. Provide valve box, lid, mounting kit, controller and weather station columns, and every other component for a compete and operable system.
 - 2. Acceptable manufacturers and models:
 - a. DIG: LEIT model 2ET.
 - b. RainBird.
 - c. Hunter.
 - d. Weathermatic.
- B. Provide the following compatible manufacturers appurtenances with this controller:
 - 1. DIG LEIT model SKIT 8821-4 switch type weatherproof adapter.

2. LEIT Valve adapter, 160HE-XXX inline valve (3/4 inch to 2 inch); LEIT Key, 1600HE solenoid actuator, and mounting column.
3. Provide two complete packages of DIG LEIT RC2ET remote communication handset with DC Car chargers, and AC wall battery chargers.

2.07 SENSORS AND WEATHER STATIONS:

- A. Weather Stations: Accurately measures, wind, rain, temperature, solar radiation, and relative humidity and computes Evapotranspiration (ET) to 0.01 inches, compatible with controller, weather computer scans sensors and recalculates weather changes every second, all electronic weather station design with non-volatile memory which retains configuration and weather data across power outages, diagnostic port and computer LEDs for troubleshooting and configuration and plug & play; factory programmed site-specific configuration. ET weather station complete with wireless transmitter power and frequency: -7 dBm @ 920 MHz / 7 dBm @ 868 MHz / -7 dBm @ 866 MHz, Humidity range and resolution: 1-99%(100% inches Hg), Relative humidity accuracy: +/- 2%, Temperature resolution and accuracy: -40°F to +170°F (-40°C to +77°C) +/- 1%, Wind speed resolution and accuracy: 0MPH (KPH) to 30 MPH (49 KPH) +/- 1%, Rainfall resolution and accuracy: .01 inches accuracy +/- 2% @ 2" per hour, Operating temperature: 14°F to 140°F (-10°C to 60°C), Dimensions: 6.07" W x 9.5" H x 13.65" D (15.42 cm W x 24.13 cm H x 34.67 cm D).
- B. Mounting connection: 1-1/4"x51" mounting column and integrated clamp with two screws.
 1. Acceptable manufacturers and models:
 - a. DIG: LEIT WWSE.
 - b. RainBird.
 - c. Hunter
 - d. Weathermatic.

2.08 SWING-JOINT/CUT OFF RISER/TUBING:

- A. Swing Joints: PVC construction ASTM D2464 Type I double joint "O" ring and buttress threads at each swivel joint, inlet/outlet socket threads ASTM D2467/D 2464.
 1. Acceptable manufacturers and models:
 - a. Hunter: SJ Series.
 - b. RainBird: TSJ Series.
 - c. Spears: 5800 Series.

- B. Polyethylene “Cut-Off” Risers: Polyethylene “cut-off” risers; 1/2 inch by 3 inches, 1/2 inch by 6 inches or 3/4 inch by 3 inches, 3/4 inch by 6 inches with 1/2-inch cut-offs.
 - 1. Acceptable manufacturers:
 - a. RainBird.
 - b. Hunter.
 - c. Weathermatic.
- C. Polyethylene Tubing other than drip tube: Flexible in 20-inch, 50-inch and 100-inch coils, with adapters compatible to the tubing.
 - 1. Acceptable manufacturers and models:
 - a. Hunter: HFT-100, including HSBE fittings.
 - b. Rainbird: “Swing Pipe”, Series SP-20, including fittings.
 - c. Weathermatic.

2.09 VALVE BOXES, BACKFLOW PREVENTER BOXES AND ENCLOSURES

- A. Turf and controller box, individual shut off valve box.
 - 1. 9 inch diameter, heavy duty polyester resin, fiberglass and calcium carbonate with stainless steel hex head bolts and washer, ANSI/SCTE – 77 Tier 8, ASTM C857 A-8.
 - a. Acceptable manufacturer and models:
 - 1). Oldcastle: Fibrelyte FL08.
- B. Meter and backflow preventer box.
 - 1. Heavy Duty Polymer concrete, nominal 30” x 48” (or as required to fit BFP) with flush 2-piece lid, ANSI/SCTE 77 Tier 15, ASTM C857 – A-12.
 - Acceptable manufacturers and models:
 - Oldcastle: Fibrelyte 3048 (H series irrigation).

2.10 MISCELLANEOUS MATERIALS

- A. Drip system Indicator, provided with DripLine irrigation system
- B. Location tape.

1. Plastic, 2" inches wide with a foil liner for location by means of a magnetic locator, such as "Terra-foil" Model D as manufactured by Griffolyn Company; Houston, Texas. Color shall be blue, having lettering which reads "WATER LINE BELOW". To be installed above main line.
- B. Wire connections.
1. All wire connections to be installed in valve boxes only. Do not bury any splices without a valve box. All wire connections shall be with proper size wire nut and sealed with 3M #DBY-6 Scotchcast kit. All wire splice kits must be UL approved.
- C. Direct bury, low voltage electrical wire.
1. Type UF 314 single stand copper with 4/64" inch thick PVC insulation, U.L. approved for direct burial. Minimum wire shall be #16GA.
- D. Pea gravel.
1. ASTM D 448, ASTM C 33, and M SHTO M43, minimum diameter of 1/8" and maximum of 3/4", more than 3% of pea gravel shall pass through a No. 3 sieve.

3.00 EXECUTION

1.01 INSTALLATION

- A. Trenching shall be such that pipe is buried below the frost line, or a minimum of 36" below grade; over excavate 6 - 8" minimum for rock, and backfill with clean sand bed before laying pipe. Lay pipe to allow for expansion and contraction. Backfill with compacted clean sandy loam, and the remainder, rock-free excavation material and topsoil. Mechanically tamp trench to 90% proctor to 2" above surrounding grade.
- B. Excavation for backflow preventer shall be 18" minimum to the top of the backflow preventer. Provide 12" of washed pea gravel beneath backflow preventer. Provide brick supports to hold backflow preventer and valve box, rest brick on undisturbed soil. Valve box shall not rest on pipe entering or exiting, provide 3" minimum clearance all around pipe. Valve box shall be level with the surrounding grade.
- C. Cut pipe clean with pipe cutters, remove burrs or foreign matter from pipe before assembly. Apply colored primer to both the pipe and fitting and then apply compatible PVC cement to the pipe. Home pipe to the fitting and hold in place for a minimum of 45 seconds until pipe has set in place. Replace pipe and fittings which slide during this time, do not re-use fittings.
- D. Install each station valve and series of wire splices in a separate turf box. Bury box level with surrounding grade, install valves level and plumb.
- E. Each branch supply system shall be automatically drainable at the low point, with a spring-loaded ball drip valve, designed for lawn sprinkler service, and draining into a 12"

excavation containing pea gravel. Dry well and gravel shall be provided by the Contractor. Top of gravel shall be below valve at drain point.

- F. Provide manual drain valves on main lines, with opening for drain into a 12" pea gravel sump. Manual drain valves shall be in a valve box with the top flush with finished grade.
- G. Subsurface dripline shall be installed in accordance with the manufacturers written installation instructions.
- H. Installation of specialties.
 - 1. Install sprinkler specialties in strict accordance to the manufacturers published instructions.
 - 2. Electrical Wiring.
 - a. Install a separate colored wire from the automatic controller to each solenoid valve. Run a common neutral from the controller to each solenoid valve common wire shall be continuous white color. Provide 12" expansion coils in each valve box.
 - b. Make splices with 3M DBY or DBR-6 wire connection kits. Strip end of wire, twist together, twist wire nuts in place and install into sealant container. All splices must be installed in valve boxes.
 - c. Install wiring in trenches alongside the piping. Provide a minimum of 12" inches of coverage for wiring installed in separate trenches. Where several wires are installed in close proximity to each other, bundle the wiring and tape securely at 10' foot intervals. Wiring installed under driveways, parking lots or pavements, shall be in SCHEDULE 40 PVC sleeves.
 - d. Ground system in accordance with the National Electric Code.
 - e. Measure the ground grid resistance with the earth test meggar and install additional ground rods and conductors as required until the resistance to the ground conforms to the requirements of the irrigation control manufacturer.
 - 3. Installation of the Irrigation Controller: In accordance with the manufacturers published instructions. Weather proof all exterior connections. All wiring above ground to be installed in rigid metallic conduit. Mount weather stations and sensors per manufacturer's recommendations.

3.02 FLUSHING AND TESTING

- A. Schedule testing with Owner's Representative a minimum of three (3) days in advance of testing.
- B. Provide clean, clear water, pumps, labor, fittings, and equipment necessary to conduct line flushing and testing procedures.

C. Recommended Dripline and Emitter Lateral Flushing Procedures.

1. Flush the system every two weeks for the first six (6) weeks and check the water that is flushed out for cleanliness. Establish a regular system flushing schedule for the future based on results from the initial six-week flushing schedule.
2. Flush the system completely after any repairs are made and monitor system operation closely under regular system flushing schedule.
3. Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken after installation.

D. Recommended Dripline and Emitter Lateral Leakage Testing Procedures.

1. Subject installed dripline tubing and emitter lateral piping to water pressure equal to specified operating pressure for ten (10) minutes. Test with control zone components and dripline flush valve components installed.
2. Partially backfill buried pipe and tubing to prevent movement under pressure. Expose couplings, fittings, and valve components.
3. Visually inspect valve assemblies and fittings for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until test segment is free from leaks. Cement or caulking to seal leaks is prohibited. Recommended Dripline and Emitter Lateral Operational Testing Procedures.
4. Activate each dripline and emitter lateral control zone valve in sequence from controller. Provide either one additional person with radio or use handheld remote to activate remote control valves from controller. Manually activating remote control valve using manual bleed mechanism at remote control valve is not an acceptable method of activation. Owner's Representative will visually observe operation, water application patterns, and leakage.
5. Replace or adjust defective valve, fitting, dripline segment, emitter lateral segment, or appurtenance to correct operational and coverage uniformity deficiencies.
6. Repeat test(s) until each dripline or emitter lateral test segment passes testing procedures. Repeat tests, replace components, and correct deficiencies at no additional cost to Owner and/or Owner's Representative.

E. Testing and Operation:

1. Before piping is pressure tested, sufficient backfill shall be installed around the piping to contain the piping under pressure. Tests shall be made in the presence of the Engineer. The entire piping system shall be placed under full pressure and left for 24 hours with pressure gauge attached, then pipe joints shall be examined for leaks. Cut out and remake any defective joint and re-test until the system performs without leaks or loss of pressure in excess of 5 percent.

2. Place the system into operation and test each section individually. The complete system shall give full and adequate coverage to the area being watered.
3. At time of final inspection, all hydrostatic tests must have been satisfactorily completed. The entire system shall then be operated in the presence of the engineer's authorized representative, and must operate in a satisfactory manner conforming to the operating requirements of the manufacturer.
4. All conditions of the contract documents shall be met before calling for final testing. All costs for re-testing due to failure to meet these conditions will be borne by the irrigation contractor including time and materials of the required inspection team.

F. Adjustments.

1. Check each system for proper operation.
2. Adjust pressure on adjustable pressure valves by attaching a pressure gauge assembly to the solenoid valve pressure regulator, and adjust pressure as necessary.
3. Adjust all components so that water runoff and overspray is reduced.
4. The irrigation contractor shall personally notify the Owners representative and general contractor at least 72 hours in advance of all final testing and inspections. The system will be tested, pressurized and adjusted by the irrigation contractor before calling for final testing and inspection. The system will not be considered complete without certification by the A/E' licensed Irrigator.
5. At time of final inspection, all hydrostatic tests must have been satisfactorily completed. The entire system shall then be operated in the presence of the engineer's authorized representative, and must operate in a satisfactory manner, with uniform coverage of the areas which are to be sprinkled.
6. All conditions of the contract documents shall be met before calling for final testing. All costs for re-testing due to failure to meet these conditions will be borne by the irrigation contractor including time and materials of the required inspection team.

3.03 MAINTENANCE

3.04 IRRIGATION WATER SCHEDULES

- A. ET based controllers shall be programmed to automatically operate within the window of opportunity provided by the owner, and automatically function.

3.05 GUARANTEE/WARRANTY AND REPLACEMENT

- A. The purpose of guarantee/warranty is to ensure that Owner receives irrigation materials of prime quality, installed and maintained in thorough and careful manner.

- B. Contractor is responsible for providing guarantee/warranty of irrigation materials, equipment, and workmanship against defects for period of one (1) year from formal written acceptance by Owner's Representative. Fill and repair depressions. Restore landscape, utilities, structures and site features damaged by settlement of irrigation trenches or excavations. Repair damage to premises caused by defective items. Make repairs within seven (7) days of notification from Owner's Representative.
- C. Replace damaged items with new and identical materials, using methods specified in contract documents or applicable codes. Make replacements at no additional cost to contract price.
- D. Guarantee/warranty applies to originally installed materials and equipment, and replacements made during guarantee/warranty period.
- E. Maintain irrigation system for duration of 30 calendar days from formal written acceptance by Owner's Representative. Make periodic examinations and adjustments to irrigation system components in order to achieve the most efficient and uniform application of water.
- F. Following completion of Contractor's maintenance period, Owner will be responsible for maintaining system in working order during remainder of guarantee/warranty period, for performing necessary minor maintenance, for protecting against vandalism, and for preventing damage after landscape maintenance operation.

3.06 OWNER TRAINING

- A. Prior to final acceptance, contractor shall provide a minimum of 4 hours or as long as required by the Owner to demonstrate to the Owner the proper operation of all irrigation system equipment and controls provided under this Section.
- B. After completion of the demonstration, submit to the Architect/Engineer a "Demonstration Certificate of Completion" signed by the Owner and the Contractor indicating that the demonstration of the irrigation system equipment and controls has been completed.

END OF SECTION

SECTION 329113

FERTILIZER

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Fertilizer in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.4.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.4

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.4.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.4.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. The work performed and materials furnished in accordance with this Item will not be paid for directly but will be subsidiary to pertinent Items.

END OF SECTION

SECTION 329119

TOPSOIL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Topsoil in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2 unless otherwise specified in the Contract Documents.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.2 unless otherwise specified in the Contract Documents.

END OF SECTION

SECTION 329223

TURFGRASS PLANTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work includes all labor, materials, and equipment for soil preparation, fertilization, planting, and other requirements regarding Turfgrass Planting areas shown on the plans.

1.02 RELATED SECTIONS

- A. Section 024100 - General Site Preparation
- B. Section 328000 - Irrigation System
- C. Section 329113 – Fertilizer
- D. Section 329119 - Topsoil

1.03 SUBMITTALS

- A. Delivery Receipts and Invoices: All delivery receipts and copies of invoices for materials used for this work shall be subject to checking by the Owner and shall be subsequently delivered to the office of the Owner.
- B. Samples and Producers' Specifications: Various samples, certificates, and specifications of seed, fertilizer, sand, compost, other soil amendments, and other materials shall be submitted for approval as required by subsequent sections of this specification.

PART 2 - PRODUCTS

2.01 TURFGRASS

- A. Bermudagrass Seed: Turfgrass seed shall be “Cynodon dactylon” (Common Bermudagrass). The seed shall be harvested within one (1) year prior to planting, free of Johnsongrass, field bind weed, dodder seed, and free of other weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. The seed shall not be a mixture. The seed shall be hulled, extra fancy grade, treated with fungicide, and have a germination and purity that will produce, after allowance for Federal Seed Act tolerances, a pure live seed content of not less than 85% using the formula: purity % times (germination % times plus hard or sound seed %). Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations.
 - 1. Certificate Submittal: Prior to planting, provide the Owner or his representative with the State Certificate stating analysis of purity and germination of seed.
- B. Sod: Turfgrass sod shall be “Cynodon dactylon” (Common Bermudagrass). Sod shall consist of stolons, leaf blades, rhizomes, and roots with a healthy, virile system of dense, thickly matted roots throughout the soil of the sod for a thickness not less than three-quarters (3/4”)

inch. Sod shall be alive, healthy, vigorous, free of insects, disease, stones, and undesirable foreign materials and grasses. The grass shall have been mowed prior to sod cutting so that the height of the grass shall not exceed two (2") inches. Sod shall have been produced on growing beds of clay or clay-loam topsoil. Sod shall not be harvested or planted when its moisture condition is so excessively wet or dry that its survival will be affected. All sod is to be harvested, delivered, and planted within a thirty-six (36) hour period of time. Sod shall be protected from exposure to wind, sun, and freezing. If sod is stacked, it shall be kept moist and shall be stacked roots-to-roots and grass-to-grass.

1. Dimensions: All sod shall have been machine cut to uniform soil thickness of one (1") inch plus or minus one-quarter (1/4") inch. All sod shall be of the same thickness. Rectangular sections of sod may vary in length, but all shall be of equal width and of a size that permits the sod to be lifted, handled, and rolled without breaking. Broken pads and torn, uneven ends will be unacceptable.

2.02 FERTILIZER

- A. General: Fertilizer shall be a commercial product, uniform in composition, free flowing, and suitable for application with approved equipment, Fertilizer shall be delivered to the site in fully labeled original containers. Fertilizer which has been exposed to high humidity and moisture has become caked or otherwise damaged making it unsuitable for use will not be acceptable.
- B. Initial Planting Application: Fertilizer for the initial planting application shall be of an organic base containing by weight the following (or other approved) percentages of nutrients: 15-15-15 (N-P-K), also containing 10-15% sulphate and traces of iron and zinc as required and approved by the Owner. At least 50% of the nitrogen component must be of a slow-release formulation such as area-based and plastic resin-coated fertilizers.
 1. Specification Submittal: Submit a sample label or specification of the fertilizer proposed to be used for the Owner's approval.
- C. Post Planting Application: Fertilizer for the post planting application will be a chemical base fertilizer containing by weight the following percentages of nutrients: 21-0-0 (N-P-K) ammonium sulphate or the nitrogen equivalent of 33-0-0 ammonium nitrate.
 1. Specification Submittal: Submit a sample label or specification of the fertilizer proposed to be used for the Owner's approval.

2.03 HYDRAULIC-MULCH MATERIALS

- A. Refer to the Public Works Construction Standards, NCTCOG 4th Edition, Item 202.6.4.4.
- B. Public Works Construction Standards, NCTCOG 4th Editions, Item 202.6.4.4 is hereby modified by excluding the compliance with NCTCOG Item 202.4 Fertilizer.
- C. Fertilizer for hydraulic mulching will comply with requirements of this specification.

2.04 SOIL AMENDMENTS (Not required.)

PART 3 - EXECUTION

3.01 GENERAL

- A. All turfing operations are to be executed across the slope, parallel to finished grade contours.

3.02 SOIL PREPARATION

- A. Contractor shall kill all vegetation prior to soil preparation.
- B. Tillage: Tillage shall be accomplished to loosen the soil, destroy existing vegetation, and prepare an acceptable seed/sprig/sod bed. All areas shall be tilled with a heavy duty disc or a chisel-type breaking plow, chisels set not more than ten (10") inches apart. Initial tillage shall be done in a crossing pattern for double coverage, followed by a disc harrow. Depth of tillage shall be five (5") inches. A heavy duty rototiller may be used for areas to be planted with sod.
- C. Cleaning: Soil shall be further prepared by the removal of debris, building materials, rubbish, weeds, and stones larger than three-quarters inch (3/4") diameter.
- D. Fine Grading: After tillage and cleaning, all areas to be planted shall be leveled, fine graded, and drug with a weighted spike harrow or float drag. The required result shall be the elimination of ruts, depressions, humps, and objectionable soil clods. This shall be the final soil preparation step to be completed before the commencement of fertilizing and planting.
- E. Rock Removal: During the soil preparation process, a "Rock Pick" or other approved piece of machinery shall be used to gather surface stones as small as three-quarter (3/4") inch in diameter. The Contractor shall be responsible for the disposal of collected materials as waste per "Clean Up" Paragraph 3.10.

3.03 FERTILIZING

- A. Initial Planting Application: The specified fertilizer shall applied at the rate of (18) pounds per one thousand (1,000) square feet (800 pounds per acre).
1. Timing: The initial planting application of fertilizer for seeded/sprigged areas shall be applied after the soil preparation, but not more than two (2) days prior to turfgrass planting. (Fertilizer shall be applied over sodded areas after planting, but not more than two (2) days later.)
- B. Post Planting Application: Thirty (30) days after planting, turfgrass areas shall receive an application of 21-0-0 or 33-0-0 fertilizer at the rate of nine (9) pounds per one thousand (1,000) square feet (400 pounds per acre).
1. Timing: The Owner or his representative will determine if it is too late in the growing season for the post planting application. In the event that it is, the application shall be made in the spring of the next year, or the cost of the application may become a credit due to the Owner.
 2. Post Planting Maintenance: See Paragraph 3.07. Areas without a uniform stand (complete coverage) that must be maintained later than thirty (30) days after the initial planting shall

receive subsequent applications of fertilizer, as described above, every thirty (30) days until a uniform stand is achieved.

3.04 PLANTING:

- A. Seeding: Following soil preparation and initial fertilizing, apply Bermudagrass seed at the rate of two (2) / three (3) pounds per one thousand (1,000) square feet (90/130 pounds per acre) or ryegrass seed at the rate of eight (8) pounds per one thousand (1,000) square feet (350 pounds per acre). Seed shall be uniformly placed with a Brillion seeder-cultipacker, or the seed shall be broadcast uniformly, followed by rolling with a weighted lawn roller.
1. Timing: Bermudagrass shall not be seeded in planting periods other than the following unless special permission is granted by the Owner: April 15 to June 15, and August 15 to September 15.
 2. Hydraulic Mulch (where required): Refer to Public Works Construction Standards, NCTCOG 4th Edition, Item 202.6.4.4.
- B. Solid Sodding: Prior to laying the sod, the planting bed shall be raked smooth to true grade and moistened to a depth of four (4") inches, but not to the extent causing puddling. The sod shall be laid smoothly, tightly butted edge to edge, and with staggered joints. The sod shall be pressed firmly into contact with the sod bed by rolling or by hand tamping with an approved tamper so as to eliminate all air pockets, provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Following compaction, fine screened soil of good quality shall be used to fill all cracks between sods. Excess soil shall be worked into the grass with suitable equipment and shall be well watered. The quantity of fill soil shall be such that it will cause no smothering of the grass.

3.05 PROTECTION: No heavy equipment shall be moved over the planted lawn area unless the soil is again prepared, graded, leveled, and replanted. It will be the responsibility of this Contractor to protect all paving surfaces, curbs, utilities, plant materials, and any other existing improvements from damage. Any damages shall be repaired or replaced at no cost to the Owner. This Contractor will also locate and stake all irrigation heads, valve risers, etc., prior to beginning any soil preparation work.

3.06 ESTABLISHMENT AND ACCEPTANCE: Regardless of unseasonable climatic conditions or other adverse conditions affecting planting operations and the growth of the turfgrass, it shall be the sole responsibility of the Contractor to establish a uniform stand of turfgrass as herein specified. When adverse conditions such as drought, cold weather, high winds, excessive precipitation, or other factors prevail to such an extent that satisfactory results are unlikely, the Owner may, at his own discretion, stop any phase of the work until conditions change to favor the establishment of turfgrass.

3.07 POST-PLANTING MAINTENANCE: Contractor shall begin maintenance immediately after each portion of grass area is planted. All planted areas will be protected and maintained by watering, weed control, and replanting as necessary for at least thirty (30) days after initial planting and for as much longer as necessary to establish a UNIFORM STAND WITH COMPLETE COVERAGE OF THE SPECIFIED GRASS. It is anticipated that a minimum of one (1) mowing will occur before the grass areas are acceptable to the Owner. Only those areas which are not completely covered with the specified grass at the end of thirty (30) days will continue to be replanted and maintained by the Contractor until complete coverage and

acceptable results are achieved. The automatic irrigation system will be available for the Contractor's use. Any other water equipment deemed necessary by the Contractor will be provided by the Contractor at his expense.

- A. Watering: Use the automatic irrigation system to apply at least one-half (1/2") inch of water over the entire planted area every three (3) days. Contractor shall water thoroughly and infrequently once grass is established to encourage deep root growth.
 - B. Mowing: Once grass is established the planted area shall be mowed at least once a week during the growing season. Grass shall be mowed to a height of one (1") inch and shall not exceed four inches (4") in height. Mowing during dormant season will be done as necessary.
 - C. Weed Control: No sooner than 45 days after grass has germinated any weed growth shall be arrested by applying MSMA broadcasted over the entire planted area. Additional applications of MSMA will be required to eliminate weed growth that continues to grow after the initial application. MSMA will only be used during the growing season. All weed growth during the dormant season will be controlled with spot applications of "Round-Up." "Round- Up" will not be used until the grass is totally dormant.
- 3.08 GRADING: All grading and placing of topsoil on any given area will be done prior to the beginning of this work. It will be the Contractor's responsibility to maintain the existing grades and leave them in a true and even condition after planting turfgrass. Finish condition of turfgrass will be such that sod sits flush with paving (topsoil 1" below paving) and such that drainage grades and swales function and to not trap drainage on the paving.
- 3.09 EROSION CONTROL: Throughout the project and the maintenance period for turfgrass, it is the Contractor's responsibility to maintain the topsoil in place at specified grades. Topsoil and turfgrass losses due to erosion will be replaced by the Contractor until establishment and acceptance is achieved.
- 3.10 CLEAN UP: This Contractor shall remove any excess material or debris brought onto the site or unearthed as a result of his turfgrass operations.
- 3.11 GUARANTEE: This Contractor shall guarantee all materials used for this work to be the type, quality, and quantity specified.

PART 4 –MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement and Payment shall be specified in the Contract Documents.

END OF SECTION

SECTION 329300**TREE, SHRUB, AND GROUNDCOVER PLANTING****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This work includes all final fine grading and minor leveling of planting areas, soil preparation, and planting. Furnish all labor, materials, equipment and services required as herein specified and indicated on the drawings. Refer to planting details on plans. NOTE: Plant beds to be left 1” below adjacent paving and slabs after settling.

1.02 RELATED SECTIONS

- A. Section 024100 - General Site Preparation
- B. Section 328000 - Irrigation System
- C. Section 329113 - Fertilizer

PART 2 – PRODUCTS

2.01 TOPSOIL

- A. All planting bed topsoil shall be soil/compost mix as produced by Living Earth Technology Co. , Dallas, Texas, or approved equal.
- B. Submittal: Submit 1 gallon samples to Owner for Approval.
- C. Existing topsoil may be used or amended if it meets the requirements for imported soil and is approved by the landscape architect. Provide a minimum of one soil sample with accompanying soil test report for each topsoil type found on the site.

2.02 COMMERCIAL FERTILIZER

- A. Shall be organic base fertilizer containing the following minimum percentages of available plant nourishment, by weight 5-10-5 (N-P-K), mixed nitrogen, not less than fifty (50%) percent from an organic source and trace elements, Wacco brand or approved equal. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
- B. Commercial fertilizer shall be a complete organic fertilizer, part of the element of which is derived from organic sources. It shall be the type percentages and applied at the rate specified in the soil analysis. Fertilizer shall be delivered mixed as specified in standard size bags, showing weight, analysis, and name of manufacturer, and shall be stored in a weatherproof storage place, and in such a manner that it will be kept dry and its effectiveness will not be impaired.
- C. Submittal: Submit labels to Owner for Approval.

2.03 SOIL AMENDMENTS (None required.)

2.04 MULCH

- A. Shall be shredded cypress bark mulch.
- B. Submittal: Submit a one (1) quart sample of proposed mulch for Owner approval.

2.05 ROOT ACTIVATOR (Not required.)

2.06 WATER: Water shall be available at the site via irrigation system. Water required in connection with planting will be furnished and paid for by the Owner provided it is not used in a wasteful manner. Any hose or other watering equipment shall be provided by the Landscape Contractor to water planting areas until the job is accepted by the Owner.

2.07 PLANT MATERIALS

- A. Plant Name and Location: The names and locations of all plants are noted on the drawings. The nomenclature of all plant materials is per Standardized Plant Names, 1942 edition and Manual of Cultivated Plants by L. H. Bailey. Plant materials not conforming to these two references will be rejected by the Owner.

- B. Quality and Size: All plant materials shall be first class representatives of their normal species or variety unless otherwise specified. They shall have a habit of growth that is normal for the species and shall be healthy, shapely, well-rooted, and vigorous. All plant materials shall be free from insect pests, plant diseases, and injuries. The containers and balls of all plants delivered to the site shall be free from any weeds or grasses which could be considered noxious or objectionable; i.e., nutgrass or Johnsongrass. ALL PLANT MATERIALS SHALL BE EQUAL TO OR EXCEED THE MEASUREMENTS SPECIFIED ON THE PLANTING PLAN WHICH ARE THE MINIMUM ACCEPTABLE SIZES. They shall be measured after pruning with the branches in normal position. The requirements for measurement, branching, grading, quality, balling and burlapping of plants specified generally follow the code of the standards currently recommended by the American Nursery and Landscape Association, in the American Standards for Nursery Stock.

- a. Trees shall not be headed back in the nursery or on site. Trees with multiple leaders, unless specified, will be rejected. Trees with damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over 20 mm (3/4 in.) in diameter that are not completely closed will be rejected. The root flare shall be visible. Trees with girdling roots will be rejected.

C. Packaging:

1. Container Grown Plants: Plants designated as “container grown” on the plans shall be full or heavy grade and shall have been growing in the specified size container for one full season prior to delivery to the site.
2. Balled and Burlapped Plants (B&B): Plants designated “B&B” on the plans shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with burlap or similar materials and bound with twine, cord, or wire mesh. Where necessary, to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform.

3. Alternate to B&B: Plants grown in containers may be accepted as B&B provided that the plant has been growing in the container for one full growing season prior to delivery. Alternate must be approved by Owner.
- D. Substitutions: Substitutions will be permitted only upon submission of proof that any plant is not obtainable and authorization by the Owner or his representative by a Change Order providing for the use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of contract price.
 - E. Biostimulants: shall contain soil conditioners, VAM, and endomycorrhizal and etomycorrhizal fungi spores and soil bacteria appropriate for existing soil conditions. Submit manufacturer literature for approval.
- 2.08 SOIL STERILANT: (Not required.)
- 2.09 WEED CONTROLLER: Shall be "Round-Up" as manufactured by Monsanto, Inc or approved equal.

PART 3 – EXECUTION

3.01 LAYOUT

Location and spacing for plants and outline of areas to be planted shall be as denoted by stem location or by notations on the plan. All tree and shrub planting locations shall be staked by the Landscape Contractor and shall be approved by the Owner prior to digging the planting pits.

3.02 SCARIFICATION

- A. All bed areas to receive planting shall be scarified to a depth of twelve (12") inches and all debris, stone, rubbish, and weeds shall be removed from the site.
- B. Weed Control: Prior to scarification the Contractor shall apply "Round-Up" herbicide to all bed areas. Follow manufacturer's directions as to timing requirements for effective weed control.

3.03 BED PREPARATION

- A. Planting areas shall be dug and soil fully prepared, graded, and made ready to receive the plants before delivery of plant materials. After planting, all beds shall be one (1") inch above finished grade to allow for settling.
- B. Groundcover and Vine Planting Areas:
 1. Commercial Soil Mix: All planting beds shall be excavated to twelve (12") inches below finished grade by Landscape/General Contractor, and all debris, stone, rubbish, weeds, and topsoil shall be removed from the site. The subgrade shall then be tilled to a depth of six (6") inches and the planting bed shall be backfilled with soil compost mix as available from Living Earth Technology Co., Inc., Dallas, Texas, or approved equal. Upon replacement of topsoil with mix and after watering in, the bed should be at the specified level.

C. Tree and Shrub Planting Pits:

1. **Planting Pits:** After scarifying, the planting pits shall be excavated. All shrub pits shall be a minimum of six (6") inches larger in diameter and three (3") inches deeper than the shrub ball or root spread. All tree pits shall be a minimum of twelve (12") inches larger in diameter and 2-3 inches less deep than the rootball. All tree pits shall be tested for percolation. If water does not drain within 24 hours, drainage or a more suitable species or location shall be provided. sp.
2. **Soil Mix:** Soil mix for backfilling the tree and shrub planting pits shall be soil/compost mix as specified for Groundcover and Vine Planting Areas.

D. Raised Planters:

1. **Backfilling:** Planters shall be backfilled with specified commercial soil mix.

3.04 DELIVERY OF PLANT MATERIALS

Plants shall be packed and protected during delivery and after arrival at the site, against climatic, seasonal, wind damage, or other injuries, and at no time shall be allowed to dry out.

3.05 PROTECTION OF PLANT MATERIALS

All plants shall be handled so that roots are adequately protected at all times from drying out and from other injury. The balls of balled plants which cannot be planted immediately on delivery shall be "heeled in" for protection with soil mulch, straw, or other acceptable material.

3.06 SETTING THE PLANTS

All plants shall be planted in pits, centered, and set to touch such depth that the finished grade level at the plant after settlement will be the same as that at which the plant was grown. Each plant shall be planted upright and faced to give the best appearance or relationship to adjacent plants or structures. No burlap shall be pulled out from under balls or balls broken when taken from containers. All broken or frayed roots shall be cut off cleanly. Prepared soil shall be placed and compacted carefully to avoid injury to roots and to fill all voids. When the hole is nearly filled, add water and root activator, mixed per manufacturer's recommendations, and allow it to soak away. Fill the hole to finished grade and form a shallow saucer around each tree or shrub by placing a ridge of topsoil around the edge of each pit after planting.

3.07 MULCHING

All plants will be mulched after planting with a three inch (3") deep layer of mulch material entirely covering the area around each plant except as noted. The root flare of trees shall not be covered with mulch. In the groundcover and massed shrub areas, the entire area between the plants is to be so treated, regardless of plant spacing.

3.08 GRADING

The surface of all planting areas shall slope as shown on the plans. Unless otherwise shown, slope one-quarter (1/4") inch per foot (two (2%) percent gradient) away from foundations and walk.

3.09 CLEANUP

All excess soil, soil preparation materials, fertilizer, or plant containers shall be removed from the site upon completion of the work.

3.10 PRUNING AND SPRAYING

Each tree will be pruned to preserve the natural shape and character of the plant. All pruning will be done after delivery to the site, under supervision of the Owner. All soft wood or sucker growth and all broken or badly bruised branches shall be removed. All pruning diameter will be painted with tree surgery paint, applied on all cambium and other living tissues immediately after cuts are made. Immediately after planting and staking, all plant material except coniferous evergreens must be sprayed with an antidesiccant, if required, using an approved power sprayer for applying an adequate film over trunks, branches, and foliage. Antidesiccants and surgery paint shall be delivered in manufacturer's sealed containers and used in accordance with their recommendations.

3.11 MAINTENANCE

The Landscape Contractor is responsible for watering, cultivating, and other necessary maintenance (including regular mowing) until the completion and acceptance of the project.

3.12 INSPECTION FOR ACCEPTANCE

- A. Inspections: Inspection of work and planting to determine completion of the work, exclusive of possible warranty plant replacement, will be made by the Owner upon notice by the Landscape Contractor. The Owner needs not less than two (2) days notice prior to the anticipated date, enabling him to schedule the inspection.
- B. Acceptance: Acceptance of all work and planting, exclusive of possible plant replacements subject to guarantee, will be granted to the Landscape Contractor, provided there are no deficiencies at inspection time. After inspection, the Landscape Contractor will be notified by a letter of acceptance of work by the Owner. All plants must be healthy (not dry or wilted) to be accepted.

3.13 GUARANTEE

- A. Terms: All shrubs and groundcover shall be guaranteed for a minimum of one (1) year and all trees for one (1) year or in accordance with the Contract Documents, whichever is greater. Guarantee begins upon Final Acceptance of project by City.
- B. Plant Replacement: At the end of each guarantee period, inspection will be made by the Owner and the Landscape Contractor. Any plant material required under this contract that is dead or not in satisfactory growth condition shall be removed and replaced with the same size and kind of plant specified, at no cost to the Owner.

3.14 MAINTENANCE GUIDE

The Landscape Contractor, upon delivery of the plant materials, shall deliver to the Owner a brief, written maintenance guide. This guide should describe recommended planting maintenance procedures, methods, products, quantities, timing, etc.

PART 4 –MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Measurement and Payment shall be specified in the Contract Documents.

END OF SECTION

SECTION 329600

REMOVAL, PROTECTION AND REPLACEMENT OF TREES, SHRUBBERY, PLANTS, SOD, AND OTHER VEGETATION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary for removal, protection and replacement of trees, shrubbery, plants, sod and other vegetation in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1
- B. ANSI A300, Pruning Standards
- C. City of Frisco Tree Preservation Ordinance
- D. City of Frisco Tree Protection Standard Details

1.03 RELATED SECTIONS

- A. Section 024100 - General Site Preparation

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1.
- B. Unless otherwise specified on the plans, trees and shrubs with calipers greater than three (3”) inches shall not be cleared (removed) provided that both of the following conditions are met:
 1. The vegetation exists in an area that is not proposed for pavement, a structure, or the playing bounds of an athletic field.
 2. The vegetation is in an area where the cut or fill does not exceed six inches (6”).
- C. The Owner will assist the Contractor in identifying trees that are to be saved from clearing if not specified in the plans. The Contractor will protect such trees from construction damage such as trunk impacts and scrapes, limb breakage, compaction of soil within the drip line, and other injurious construction activities. If necessary, the Owner may direct the Contractor, at the Contractor’s expense, to erect protective stockades along the drip lines of trees that the

Owner considers vulnerable to damage. Such stockades shall be of eight foot (8') long x six inch (6") diameter posts vertically buried three feet (3') deep at six foot (6') intervals along the drip line.

- D. Where grading or clearing and grubbing operations are to occur between trees that are to be preserved and protected, the Contractor will prune the lower branches of these trees as necessary to prevent their breakage and to permit access by construction machinery. Branches will be cut off to the trunk or major limb pursuant to ANSI A300. The Owner may direct that the Contractor remove additional branches in such a manner that the tree presents a balanced appearance. Scars will be treated with a heavy coat of an approved tree sealant.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1 unless otherwise specified in the Contract Documents.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 202.1 unless otherwise specified in the Contract Documents.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 330510

TRENCHING, BACKFILLING AND COMPACTION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to perform Trenching, Backfilling and Compaction operations for utility construction in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 107.19.3, 203 and 504.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 107.19.3, 203 and 504

1.03 SUBMITTALS

- A. Trench safety plan in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 107.19.3.3.

PART 2 – PRODUCTS

Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.2.

PART 3 – EXECUTION

3.01 CONSTRUCTION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 107.19.3, 203 and 504.
- B. Trenches shall be excavated by a trenching machine, backhoe or dragline, except in locations where hand trenching is required. The banks of trenches shall be vertical, to a point one foot (1') above the top of pipe.
- C. The excavation shall not advance more than three hundred feet (300') ahead of the completed and backfilled line. Pipe shall be laid in all trenches that have been opened before the end of each day's work, unless the Contractor secures written permission to do otherwise from the Inspector.
- D. The final backfill shall be moisture treated to a minimum of 3 percentage points above optimum moisture content at a minimum of 95 percent standard Proctor (ASTM D 698).

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.7 for measurement of backfill.

- B. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 107.19.3.6 for measurement of trench safety.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 504.7 for payment of backfill.
- B. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 107.19.3.6 for payment of trench safety.
- C. All excavation for utility installation shall be considered subsidiary to the utility bid item. No separate pay item for excavation, backfill and/or trenching, unless otherwise noted.

END OF SECTION

SECTION 330523

TRENCHLESS UTILITY INSTALLATION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install utility lines using trenchless installation methods in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503.

1.02 REFERENCES

- A. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503
- B. City of Frisco's Standard Details included in the plans.

1.03 QUALITY ASSURANCE

A. DESIGN CRITERIA

The pipe casing (or carrier pipe on uncased bores) shall be designed by a Licensed Professional Engineer for the following loading conditions and applicable combinations thereof:

1. Cooper's E-80 Railway loading or AASHTO HS20 loading as applicable
2. Earth loading with the height of fill above the casing as shown on the plans
3. Loads applied during jacking, including axial load from jacking
4. All other applicable loading conditions, including loads applied during transportation and handling.

B. INSTALLER'S QUALIFICATIONS

Installation shall be by a competent, experienced contractor or sub-contractor. The installation contractor shall have a satisfactory experience record of at least three (3) years engaged in similar work of equal scope.

All welding shall be performed by a certified welder in the state of Texas.

C. PERFORMANCE REQUIREMENTS

Lateral or vertical variation in the final position of the pipe casing (or carrier pipe on uncased bores) from the line and grade established by the ENGINEER shall be permitted only to the extent of 1" in 10' feet, provided that such variation shall be regular and only in the direction that will not detrimentally affect the function of the carrier pipe.

1.04 SUBMITTALS

Submittals shall include:

- A. Shop drawings of the casing pipe (or carrier pipe for uncased bores) from the manufacturer. Shop drawings shall include calculations for the design of the casing pipe (or carrier pipe for uncased bores) by a Licensed Professional Engineer.
- B. Provide Certificate of Adequacy of Design of casing and/or carrier pipe.
- C. Provide record data of casing insulators including sketches of insulators with material components and dimensions and proposed locations of insulators.
- D. Provide Pressure Grout material and method.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503.2.
- B. High Density Polyethylene casing spacers are required unless otherwise specified. Refer to the City of Frisco Approved Materials List.
- C. Steel casing pipe shall be new (or used if approved by the OWNER) and suitable for the purpose intended and shall have a minimum yield strength of 35,000 psi. Casing shall meet ASTM A-36, ASTM A-570, ASTM A-135, ASTM A-139, or approved equal.
- D. Casing pipe shall be coated with coal tar epoxy (15 mils min.) in accordance with AWWA C-210. Pipe joints shall be welded in accordance with AWWA C-206. After pipe is welded, coating shall be repaired.

PART 3 – EXECUTION

3.01 GENERAL

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503.3.
- B. All casing pipe joints shall be watertight with no water entering the casing from any sources prior to carrier pipe installation.
- C. The carrier pipe shall be installed within the casing between the limits indicated on the Plans to the specified lines and grades, and utilizing methods which include due regard for safety of workers, adjacent structures and improvements, utilities, and the public.
- D. Furnish all necessary equipment, power, water, and utilities for carrier pipe installation, insulator runner lubricant, grouting, and other associated Work required for the Contractor's methods of construction.
- E. Conduct all operations such that trucks and other vehicles do not interfere with traffic or create a dust or noise nuisance in the streets and to adjacent properties. Promptly clean up, remove, and dispose of spoils and slurry spillage and any slurry discharges.

- F. All Work shall be done so as not to disturb roadways, adjacent structures, landscaped areas, or existing utilities. Any damage shall be immediately repaired to original or better condition and to the satisfaction of Engineer.

3.02 INSTALLATION OF CARRIER PIPE

- A. Pipe Installation: Carrier pipe shall meet the requirements of the applicable Specification section. Remove all loose soil from casing. Grind smooth all rough welds at casing joints. Provide casing spacers, or insulators, or other approved devices, as required, to prevent flotation, movement, or damage to the pipe during installation and annular space grout placement. Every individual pipe section should be supported by spacers as shown in the City's Standard Details. Carrier pipe shall be installed without sliding or dragging it on the ground or in the casing in a manner that could damage the pipe. Coat the casing spacer runners with a non-corrosive/environmentally safe lubricant to minimize friction when installing the carrier pipe.
- B. Testing of Carrier Pipe: Testing of the carrier pipe joints shall be completed prior to the filling of the annular space between the casing and carrier pipe with grout. Pressure testing shall be performed in accordance with the specification for the selected pipe material. Any leakage found during this inspection shall be corrected.
- C. Backfill Annular Space with Grout: After the installation of the carrier pipe, the annular space (all voids) between the casing and the carrier shall be filled with grout so all remaining surfaces of the exterior carrier pipe wall and casing interior are in contact with the grout. Furnish the necessary grout, equipment, hoses, valves, and fittings for the backfilling operation. Grout shall be pumped through a pipe or hose. Use grout pipes, or other appropriate materials to avoid damage to carrier pipe during grouting. The grout shall be proportioned to flow and to completely fill all voids between the carrier pipe and the casing. The Contractor shall provide end seals, as approved by the Engineer at each end of the casing to contain the grout backfill. The end seals shall be designed to withstand the anticipated grouting pressure and be watertight to prevent groundwater from entering the casing. Block the carrier pipe during grouting to prevent flotation during grout installation. The Contractor shall also protect and preserve the interior surfaces of the casing from damage. It is the responsibility of the Contractor to submit to the Engineer sufficient information indicating all proposed equipment, materials, and the method for filling this void.

3.03 SAFETY

- A. The Contractor is responsible for safety on the job site. Perform all Work in accordance with the current applicable regulations of the Federal, State, and local agencies. In the event of conflict, comply with the more restrictive applicable requirement.
- B. No gasoline powered equipment shall be permitted in jacking shafts and receiving shafts/pits. Diesel, electrical, hydraulic, and air powered equipment is acceptable, subject to applicable local, state, and federal regulations.
- C. Methods of construction shall be such as to ensure the safety of the Work, Contractor's and other employees on site, and the public.
- D. Furnish and operate a temporary ventilation system in accordance with applicable safety requirements when personnel are underground. Perform all required air and gas monitoring.

Ventilation system shall provide a sufficient supply of fresh air and maintain an atmosphere free of toxic or flammable gasses in all underground work areas.

- E. Perform all Work in accordance with all current applicable regulations and safety requirements of the Federal, State, and local agencies. Comply with all applicable provisions of 29 CFR Part 1926, Subpart S, Underground Construction and Subpart P, Excavations, by OSHA. In the event of conflict, comply with the more stringent requirements.
- F. The Contractor shall develop an emergency response plan for rescuing personnel trapped underground in a shaft excavation or pipe. Keep on-site all equipment required for emergency response in accordance with the agency having jurisdiction.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503.4.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 503.4.

END OF SECTION

33 05 23.13 UTILITY HORIZONTAL DIRECTIONAL DRILLING

1.00 GENERAL

1.01 WORK INCLUDED

- A. Provide and install underground force main line using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring, guided horizontal boring. This work shall include equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and erosion and sedimentation control and restoration.

1.02 QUALITY ASSURANCE

- A. The requirements set forth in this document specify a wide range of procedural precautions necessary to provide the very basic, essential aspects of a proper directional bore installation and are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Owner's Representative approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.
 - 1. Installer's Qualifications: Installation shall be by a competent, experienced contractor or sub-contractor. The installation contractor shall have a satisfactory experience record of at least 3 years engaged in similar work of equal scope. If patented processes are involved based on the pipe selection, the installer shall be licensed, trained and in good standing with the pipe manufacturer.
 - 2. Performance Requirements: Lateral or vertical variation in the final position of the carrier pipe from the line and grade established by the plans shall be permitted only to the extent of 4 percent, provided that such variation shall be regular and only in the direction that will not detrimentally affect the function of the carrier pipe.
 - 3. Certification: Pipe products shall have been tested and approved by an independent third-party laboratory for continuous use at rated pressures.
 - 4. Design Criteria: The maximum allowable load for PVC pipe installations shall produce a maximum deflection of 4 percent.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
 - 1. Work Plan: Prior to beginning work, the Contractor shall submit to the Owner's Representative a work plan as record data detailing the procedure and schedule to be used to execute the project. The work plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), all

excavation locations, interfering utilities, and flow bypass, an erosion and sedimentation control plan and contingency plans for possible problems. Work plan should be comprehensive, realistic and based on actual working conditions for the project.

2. Equipment: Contractor will submit specifications on directional drilling equipment as record data. Equipment shall include but not be limited to: drilling rig, butt fusion welding apparatus, mud system, mud motors (if applicable), down-hole tools, guidance system, rig safety systems. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that Contractor intends to use or might use will be submitted.
3. Material: Provide shop drawings of the pipe with material specifications, including size, type, diameter and manufacturer’s data and certifications on piping and jointing methods. The shop drawing shall include a Certificate of Adequacy of Design stating the pipe and fittings are satisfactory for the loads which will be imposed during for all loading conditions.
4. Contractor shall maintain a daily project log of drilling operations and a guidance system log along with a fusion report for all butt fused welding of joints with a copy given to Owner’s Representative at completion of project.

1.04 STANDARDS

A. The applicable provisions of the following standards shall apply as if written here in their entirety:

1. American Society for Testing and Materials (ASTM) Standards:

ASTM D1784	Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds
ASTM D2152	Test Method for Degree of Fusion of Extruded PVC Pipe and Molded Fittings by Acetone Immersion
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pressure Pipe

2. American Water Works Associations (AWWA) Standards:

AWWA C905	Standard for PVC Pressure Pipe and Fabricated Fittings, 14 through 48 inches, for Water Distribution
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1.05 DELIVERY AND STORAGE

A. Store PVC pipe material so that there is no exposure to sunlight.

1.06 JOB CONDITIONS; PERMITS AND EASEMENT REQUIREMENTS

A. Where the work is in the public right-of-way the Contractor will secure the appropriate permits or easements. The Contractor shall observe regulations and instructions of the right-of-way Owner as to the methods of performing the work and take precautions for the

safety of the property and the public. Negotiations and coordination with the right-of-way Owner shall be carried on by the Contractor, not less than 5 days prior to the time of his intentions to begin work on the right-of-way.

- B. Comply with the requirements of the permit and/or easement. If required by the Right-of-Way Owner, obtain Protective Liability Insurance in the amount required by the particular company or other insurance as is specified in the permit at no cost to the Owner. Acquire a permit, agreement, or work order from the right-of-way Owner as is required.
- C. Construction along roads and public areas shall be performed in such manner that does not interfere with the operations of the roads, driveways, sidewalks, pedestrian traffic and railroads.
- D. Barricades, warning signs, and flagmen, when necessary and specified, shall be provided by the Contractor.
- E. No blasting shall be allowed.
- F. Existing pipelines and underground conduits are to be protected. The Contractor shall verify location and elevation of any pipe lines, telephone cable and fiber optics before proceeding with the construction and shall plan his construction so as to avoid damage to the existing pipe lines or telephone cables. Verification of location (vertical and horizontal) of existing utilities shall be the complete responsibility of the Contractor.

2.00 PRODUCTS

2.01 GENERAL

- A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the crossing, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system.
- B. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.02 DRILLING SYSTEM

- A. **Drilling Rig:** The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pullback operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.

- B. Drill Head: The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.
- C. Pressure Tool: A pressure tool shall be used on the drill stem for the pilot hole, and monitored by the Mud Engineer to mitigate Inadvertent Releases from occurring.
- D. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.
- E. Drill Pipe: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.03 GUIDANCE SYSTEM

- A. A Magnetic Guidance System (MGS) or proven gyroscopic system shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to 100 feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to plus or minus 2 percent of the vertical depth of the bore hole at sensing position at depths up to 100 feet and accurate within 1.5 meters horizontally.
- B. The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.04 DRILLING FLUID MUD SYSTEM

- A. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. The drilling fluid reservoir tank shall be of sufficient size for making the bore. Mixing system shall continually agitate the drilling fluid during drilling operations.
- B. Drilling Fluids: Drilling fluid shall be composed of clean water and appropriate additives. Water shall be from an authorized source with a pH of 8.5 to 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.
- C. Delivery System: The mud pumping system shall have a minimum capacity to maintain correct boring alignment and be capable of delivering the drilling fluid at a constant pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. A berm, minimum of 12 inches high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

- D. Drilling Fluid Recycling System: The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid reusable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

2.05 OTHER EQUIPMENT

- A. Pipe Rammers: Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.
- B. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.06 PIPING MATERIALS

- A. Force Main Materials:
 - 1. Force Main PVC Piping shall be 20-inch diameter Fusible AWWA C905 CLASS 235 (DR-18) by Underground Solutions or approved equal.
- B. Pipe Markings: Pipe shall be legibly marked in permanent ink with the manufacturer and trade name, nominal size and DR rating/pressure class, hydrostatic proof test pressure, manufacturer date code, and marked "Forced Sewer".

3.00 EXECUTION

3.01 GENERAL

- A. The Engineer and Owner's Representative must be notified 48 hours in advance of starting work. The Directional Bore shall not begin until the Owner's Representative is present at the job site and agrees that proper preparations for the operation have been made.
- B. The approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Owner's Representative to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.02 PERSONNEL REQUIREMENTS

- A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. The operator of the drilling rig must have at least 3 years directional drilling experience. A responsible representative who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Directional Bore operation. The Contractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.

- B. Mud Engineer: The Contractor shall have a trained Mud Engineer with at least 3 years engaged in similar work of equal scope. The Mud Engineer shall be present for the pilot hole and all subsequent ream bores. The pilot drill pressures shall be monitored by the Mud Engineer through the use of a pressure tool placed on the drill stem, in order to mitigate any occurrences of Inadvertent Releases. The pressure tool is not required on subsequent reamer passes.

3.03 DRILLING PROCEDURES

- A. Site Preparation: Prior to any alterations to work-site, contractor shall photograph or video tape entire work area, including entry and exit points, one copy of which shall be given to Owner's Representative and one copy to remain with contractor for a period of 1 year following the completion of the project. Work sites shall be within right-of-way and shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.
- B. Drill Path Survey: Entire drill path shall be accurately surveyed by the Contractor with entry and exit stakes placed in the appropriate locations within the areas determined in the field with the Owner's Representative. Locate existing utilities in advance of boring operations. The Contractor shall be responsible for repairing damage to existing utilities at no additional cost to the Owner. Repair of existing utilities shall proceed until complete and the existing utility is back in service. If contractor is using a magnetic guidance system, drill path shall be surveyed by the Contractor for any surface magnetic variations or anomalies.
- C. Environmental Protection: Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Fuel may not be stored in bulk containers within 200 feet of any water-body or wetland.
- D. Safety: Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.
- E. Pilot Hole:
 - 1. Pilot hole shall be drilled on bore path with no deviations greater than 4 percent horizontally or vertically over a length of 100 feet. In the event that pilot hole does deviate from bore path more than 4 percent, Contractor shall notify Owner's Representative who may require contractor to pull-back and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes.
 - 2. If mud fracture or returns loss continues, contractor will cease operations and notify Owner's Representative. Owner's Representative and contractor will discuss additional options and work will then proceed accordingly.

F. Reaming: Upon successful completion of pilot hole, contractor will ream bore hole to a minimum of 25 percent greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

G. Pull-Back:

After successfully reaming bore hole to the required diameter, contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Pull loads shall not exceed the limits shown in the following tables. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole.

PVC Fusible PVC - Underground Solutions Maximum Pull Loads			
AWWA C905			
Size (in.)	DR	Minimum Radius (ft.)	Maximum Pull In Force (lb.)
20	18	450	215,300

1. During pull-back operations contractor will not apply more than the maximum safe pipe pull pressure at any time. In the event that pipe becomes stuck, contractor will cease pulling operations to allow any potential hydro-lock to subside and will recommence pulling operations. If pipe remains stuck, contractor will notify Owner’s Representative to discuss options and then work will proceed accordingly.

3.04 FUSIBLE PVC PIPE JOINING

- A. The pipe shall be assembled and joined at the site using the thermal butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be used in strict compliance with the manufacturer’s recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of the pipe and/or fusing equipment.
- B. The butt-fused joint shall be true alignment and shall have uniform roll-back beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. When cool, all weld beads shall then be removed from the outside surface such that the joint surfaces shall be smooth. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the Owner’s Representative prior to insertion. All defective joints shall be cut out and replaced at no cost to the Owner. Any section of the pipe with a gash, blister, abrasion, nick, scar or other deleterious fault greater in depth than 10 percent of the wall thickness, shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by the Owner’s Representative shall be discarded and not used.

- C. Terminal sections pipe that are joined within the insertion pit shall be connected with a full circle pipe repair clamp. The butt gap between pipe ends shall not exceed 1/2 inch.

3.05 PIPE TESTING

- A. Following successful pull-back of pipe, contractor will test pipe using potable water according to the City's requirements. A calibrated pressure recorder will be used to record the pressure during the test period. This record will be submitted to Owner's Representative.

3.06 SITE RESTORATION

- A. Following drilling operations, contractor will de-mobilize equipment and restore the worksite to original condition. All excavations will be backfilled and compacted to 95 percent of original density.

4.00 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to project specification 01 29 00, "Payment Procedures".

4.02 PAYMENT

- A. Refer to project specification 01 29 00, "Payment Procedures".

END OF SECTION

SECTION 331113

DUCTILE IRON PIPE AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Ductile Iron Pipe and Fittings in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.7. and Item 506.

1.02 REFERENCES

- A. ANSI/AWWA C104/A21.4 - American National Standard for Cement - Mortar Lining for Ductile-Iron Pipe and Fittings for Water, Latest Revision.
- B. ANSI/AWWA C105/A21.5 - American National Standard for Polyethylene Encasement, Latest Revision.
- C. ANSI/AWWA C110/A21.10, AWWA Standard for Ductile-Iron and Gray-Iron Fittings, Latest Revision.
- D. ANSI/AWWA C111/A21.11, AWWA Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings, Latest Revision.
- E. ANSI/AWWA C115/A21.15, AWWA Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges, Latest Revision.
- F. ANSI/AWWA C150/A21.50,⁸ American National Standard for the Thickness Design of Ductile-Iron Pipe, Latest Revision.
- G. ANSI/AWWA C151/A21.51, AWWA Standard for Ductile Iron Pipe, Centrifugally Cast, Latest Revision.
- H. ANSI/AWWA C153/A21.53, AWWA Standard for Ductile-Iron Compact Fittings for Water Service, Latest Revision.
- I. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances, Latest Revision.
- J. AWWA C651, AWWA Standard for Disinfecting Water Mains, Latest Revision.
- K. AWWA Manual of Practice M41 Ductile-Iron Pipe and Fittings, Latest Revision.
- L. *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 501.7 and 506.

1.03 RELATED SECTIONS

- A. Section 330510 – Trenching, Backfilling and Compaction

- B. Section 331240 – Polyethylene Encasement
- C. Section 331245 – Tapping Sleeves for PVC and Ductile Iron Pipe
- D. Section 331260 – Mechanical Restraint for Ductile Iron Pipe

1.04 SUBMITTALS:

Submittals shall be in accordance with the General Conditions and shall include the following:

A. Submittals required prior to fabrication

1. Pipe design calculations sealed by a Licensed Engineer in the State of Texas.
2. Pipe layout drawings including horizontal stations and locations and vertical elevations sealed by a Licensed Engineer in the State of Texas.
3. Thrust restraint calculations sealed by a Licensed Engineer in the State of Texas.
4. Certification with full compliance with the specifications
5. Complete materials specification for each part to be furnished.
6. Technical Bulletins and Brochures
7. Statement of Warranty.
8. An estimated delivery date for the equipment (which shall be stated in calendar days after the releases date to the manufacturer).
9. Name, address, phone number, and fax number of manufacturer's representative.
10. Test to be run during manufacturing process

B. Submittals required prior to Shipping

1. Certified copies of all test.
2. Lifting instructions

1.04 QUALITY ASSURANCE

- A. Manufacturer: Finished pipe shall be the product of one (1) manufacturer. Pipe manufacturing operations (pipe, fittings, lining, coating) shall be performed at one (1) location.

1.05 DELIVERY AND STORAGE

- A. Delivery and Storage shall be in accordance with AWWA C600 and AWWA Manual of Practice M41.

PART 2 – PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.7.
- B. Buried ductile iron pipe may be mechanical joint, push-on joint, or restrained push-on joint.
- C. All ductile iron pipe shall be cement mortar lined in accordance with AWWA C104.
- D. All buried pipe shall be polyethylene encased in accordance with AWWA C105.
- E. The pressure rating, thickness class, net weight of pipe without lining, length of pipe and name of manufacturer shall be clearly marked on each pipe.

2.02 DUCTILE IRON FITTINGS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.7.
- B. Mechanical joints shall be furnished complete with accessories. Bolts and nuts shall be stainless steel.
- C. Fittings shall be provided with bituminous exterior coating and cement-mortar lining inside with seal coat in accordance with AWWA C104.
- D. All buried fittings shall be polyethylene encased in accordance with AWWA C105.
- E. Unless otherwise specified, all fittings shall be of the mechanical joint type with a minimum pressure rating of 250 psi.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 505.1. and 502.4.

3.02 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.
- B. Jointing Push-On Pipe
 1. Remove any foreign matter in the gasket seat of the socket, wipe gasket clean, flex gasket and place in socket with the large round end or bulb end entering first.
 2. Seat gasket evenly around the inside of the socket with the groove fitted over the bead. Remove any bulges.
 3. Apply a thin film of lubricant furnished by the pipe manufacturer to the inside surface of the gasket. No lubricant other than that furnished with the pipe by the pipe manufacturer will be allowed to be used.
 4. Wipe plain end of pipe, to be entered; clean and place in approximate alignment with the bell of the pipe to which it is to be jointed.

5. Apply a thin film of the lubricant to the outside of the plain end about 1” back from the end.
6. Align the pipe and carefully enter the plain end into the socket until it just makes contact with the gasket.
7. Complete joint assembly by forcing the plain end of the entering pipe past the gasket until it makes contact with the bottom of the socket.
8. The maximum deflection at each joint shall not exceed 80% of manufacturer’s recommendation.

C. Jointing Mechanical Joint Pipe

1. After carefully cleaning both spigot and bell and after slipping the following ring and the gasket over the spigot end, the spigot shall be slipped into the bell.
2. A lubricant shall be applied to the spigot end to assist in the assembly as directed by the Inspector.
3. The gasket shall be carefully seated by hand so as to be even in the bell at all points.
4. After drawing up the follower ring to uniform bearing against the gasket the bolts shall be inserted and tightened by hand in pairs using bolts opposite each other.
5. The nuts are to be tightened to hold the required pressure. Extension wrenches or pipes over wrench handles will not be permitted. Ten-inch (10”) ratchet wrenches with a tension setting control shall be used to tighten the nuts unless other types of wrenches are approved by the Inspector.
6. The finished joint shall be neat and uniform and shall be watertight.

D. Concrete thrust blocks and mechanically restrained joints shall be required to resist thrust forces at all horizontal and vertical bends, tees and other fittings.

E. Water mains twelve inches (12”) and smaller in the right-of-way near storm inlets shall be constructed behind the inlet by pulling the pipe using longitudinal bending in accordance with the manufacturer’s requirements.

F. The maximum deflection angle of pipe joints shall be restricted to 80% of the manufacturers’ recommendation. Otherwise, horizontal bends will be required.

G. Potable water mains and wastewater mains must be installed in separate trenches.

H. New tracer wire shall be installed in the trench with all water mains with a terminal box located in each water main valve pad.

3.03 HYDROSTATIC TEST

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.5 alternative 2-hour testing in accordance with AWWA C600.
- B. After the pipe has been laid and backfilled, but prior to replacement of pavement, each valved section of newly laid pipe shall be subjected to a hydrostatic pressure test.
- C. Each valved section of pipe shall be slowly filled with water by means of a pump connected to the pipe in a satisfactory manner.

- D. The pump, pipe connection, and all necessary apparatus including gauges and meters shall be furnished by the Contractor. The City will furnish water for filling lines and making tests through existing mains.
- E. The test pressure shall be measured at the point of lowest elevation.
- F. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at the points of highest elevation and afterwards tightly plugged.
- G. At intervals during the test the entire route of the pipe line shall be inspected to locate any leaks or breaks. Any defective joints, cracked or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided, and the test shall be repeated until satisfactory results are obtained.

3.04 PURGING AND DISINFECTION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.7.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.9.1.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.9.2.

END OF SECTION

SECTION 331114

PVC PIPE FOR WATER DISTRIBUTION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Polyvinyl Chloride (PVC) Water Pipe For Water Distribution in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.14.

1.02 REFERENCES

- A. AWWA C900, AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100 mm through 300 mm) for Water Distribution
- B. AWWA C905, AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350 mm through 1,200 mm), for Water Transmission and Distribution
- C. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.14, 502.4.2, and 502.5

1.03 RELATED SECTIONS

- A. Section 330510 – Trenching, Backfilling and Compaction
- B. Section 331245 – Tapping Sleeves for PVC and Ductile Iron Pipe
- C. Section 331260 – Mechanical Restraint for PVC and Ductile Iron Pipe

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 501.14.
- B. Pipe shall be manufactured in the United States of America and shall be blue in color.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 505.1. and 502.4.

3.02 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Items 502.4 and 506.

- B. Concrete thrust blocks and mechanically restrained joints shall be required to resist thrust forces at all horizontal and vertical bends, tees and other fittings.
- C. Water mains twelve inches (12”) and smaller in the right-of-way near storm inlets shall be constructed behind the inlet by pulling the pipe using longitudinal bending in accordance with the manufacturer’s requirements.
- D. The maximum deflection angle of pipe joints shall be restricted to 80% of the manufacturers’ recommendation. Otherwise, horizontal bends will be required.
- E. Potable water mains and wastewater mains must be installed in separate trenches.

3.03 HYDROSTATIC TEST

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.5 alternative 2-hour testing in accordance with AWWA C605. Testing pressure is 200 psi.
- B. After the pipe has been laid and backfilled, but prior to replacement of pavement, each valved section of newly laid pipe shall be subjected to a hydrostatic pressure test.
- C. Each valved section of pipe shall be slowly filled with water by means of a pump connected to the pipe in a satisfactory manner.
- D. The pump, pipe connection, and all necessary apparatus including gauges and meters shall be furnished by the Contractor. The City will furnish water for filling lines and making tests through existing mains.
- E. The test pressure shall be measured at the point of lowest elevation.
- F. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at the points of highest elevation and afterwards tightly plugged.
- G. At intervals during the test the entire route of the pipe line shall be inspected to locate any leaks or breaks. Any defective joints, cracked or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided, and the test shall be repeated until satisfactory results are obtained.

3.04 PURGING AND DISINFECTION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.7.
- B. The contractor is solely responsible for injecting the chlorine disinfectant into the conduit, monitoring the solution, collecting samples, and performing the water analysis by an approved laboratory.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.9.1.

4.02 PAYMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 506.9.2.

END OF SECTION

SECTION 331216

**AIR VALVES FOR POTABLE WATER SYSTEMS
AND WASTEWATER FORCE MAINS**

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Air Release Valves For Potable Water Systems in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.3.

1.02 REFERENCES

- A. AWWA C512, AWWA Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service, Latest Revision.
- B. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.3
- C. City of Frisco’s Standard Details for Combination Air Vacuum Valves.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.3.
- B. Air valves for potable water systems shall be Vento-Mat Series RBX or approved equal.
- C. Air valves for wastewater force mains shall be Vento-Mat Series RGX or approved equal.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.6.2.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.8.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.8.

END OF SECTION

33 12 16.19 ECCENTRIC PLUG VALVES

1.00 GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials, equipment and incidentals necessary to install eccentric plug valves.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. M&H
 - 2. Clow
 - 3. DeZurick
 - 4. Pratt
 - 5. Approved Equal

1.03 SUBMITTALS

- A. Submittals shall include:
 - 1. Shop drawings.
 - 2. Operation and Maintenance Manuals.

1.04 STANDARDS

- A. The applicable provisions of the following standards shall apply as if written here in their entirety:
 - 1. American Water Works Association (AWWA) Standards:

AWWA C111	Standard for Rubber Gasket Joints for Ductile Iron Pipe and Fittings
AWWA C517	Resilient-Seated Cast-Iron Eccentric Plug Valves

- 2. ASTM International:

A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A536	Standard Specification for Ductile Iron Castings

2.00 PRODUCTS

2.01 MATERIALS

- A. Valve Bodies: Ductile iron in accordance with ASTM A536, Grade 65-45-12 or cast iron in accordance with ASTM A126 Class B.
- B. Flanges: Class 125 conforming to ANSI standard for cast-iron flanges.

- C. Mechanical Joint Ends: For buried service shall be to AWWA Standard C111.
- D. Nuts, Bolts, Springs, etc.: Type 316 Stainless Steel.
- E. Resilient Plug Facings: Neoprene, nitrile rubber, BUNA-N, or approved equal.
- F. Mating Surface: Overlaid with thick, welded and machined nickel alloy.
- G. Valve Boxes: Three-piece cast iron screw extension type, per the City's Approved Manufacturer List. Valves boxes shall be Tyler Union 30U 6850, PROSELECT PSVBxxxSW, or Star Pipe VB-0001. The three pieces are the 2-piece screw-type valve box, and lid.

2.02 ECCENTRIC PLUG VALVES

- A. Eccentric valves shall be non-lubricated quarter-turn type with resilient faced plugs. Unless otherwise indicated, buried valves shall be furnished with mechanical joint ends and exposed valves shall be furnished with flanged ends. Valves shall be full-port.
- B. Valves 6 inches and smaller shall be wrench operated unless otherwise shown or scheduled. Supply a wrench operator for each wrench operated valve. Larger valves shall be supplied with a handwheel.
- C. Valves shall come complete with a totally enclosed worm gear operator. Valves shall have seals on all shafts and gaskets valve operator covers to prevent the entry of water.
- D. Valves for buried service shall be supplied with cast iron valve boxes. The valve box shall be firmly supported, maintained, centered, and plumb over the wrench nut of the plug valve, with box cover flush with the surface of the ground.
- E. Where noted on the Plans or scheduled herein, buried valves shall be supplied with above-ground handwheel or electric motor operators. The Manufacturer shall supply valve box, floor stand and extension stem and necessary appurtenances for complete installation. The floor stand shall come complete with a dial valve position indicator.

3.00 EXECUTION

3.01 INSTALLATION

- A. Carefully handle and lower valves into position in such a manner as to prevent damage to any part of the valves. Place the valve in the proper position with stem truly vertical or horizontal as the case may be. Furnish bolts and gaskets for flange connections. Adjust the valve boxes to the proper length to conform with the ground surface.

3.02 PAINTING

- A. Valves to be buried shall receive a shop applied protective coating by the manufacturer.

END OF SECTION

SECTION 331217

RESILIENT SEATED GATE VALVES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Resilient Seated Gate Valves for potable water systems in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.2.

1.02 REFERENCES

- A. AWWA C509, AWWA Standard for Resilient Seated Gate Valves for Water Supply Service, Latest Revision.
- B. AWWA C515, AWWA Standard for Reduced Wall, Resilient Seated Gate Valves for Water Supply Service, Latest Revision.
- C. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.2
- D. City of Frisco’s Standard Detail for Gate Valves.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.2.
- B. Gate valves shall be Mueller Model Series 2360, M&H Model Series 4067/7571, American Flow Control Model Series 2500 or approved equal.
- C. Valve boxes shall be three (3) piece screw type cast iron of the extension type. The three (3) pieces shall consist of the top section, bottom section and cover.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.6.1.
- B. All valve locations shall be marked with a “V” sawcut on the curb or pavement. The “V” shall point to the location of the valve as follows:

Valve in pavement	Upright “V”
Valve outside pavement	Upside Down “V”

- C. Valve boxes over four feet (4’) deep shall require extensions. Valve box extensions shall be cast iron. PVC pipe is not allowed.

3.02 HYDROSTATIC TEST

- A. Gate valves shall be tested at a hydrostatic test pressure of 400 psi and shall be guaranteed for 200 psi working pressure.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.8.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.6.8.

END OF SECTION

SECTION 331240

POLYETHYLENE ENCASEMENT

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install polyethylene encasement around metal pipe and fittings in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8.

1.02 REFERENCES

- A. AWWA C105, AWWA Standard for Polyethylene Encasement for Ductile Iron Pipe Systems.
- B. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8.1.
- B. The polyethylene encasement may be in tube or sheet form and shall have a minimum thickness of 8 mils.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8.2.
- B. The polyethylene seams and overlaps shall be wrapped and held in place by 2” wide plastic backed adhesive tape with 2 foot wide overlaps.
- C. The wrap on the barrel of the pipe shall be loose enough to allow the polyethylene encasement to shift with the soil.
- D. The polyethylene encasement shall be installed without breaks, tears or holes.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8.4.

4.02 PAYMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.8.4.

END OF SECTION

SECTION 331260

MECHANICAL RESTRAINT FOR PVC AND DUCTILE IRON PIPE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install thrust restraint for polyvinyl chloride (PVC) and ductile iron water pipe in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.2.

1.02 REFERENCES

- A. ANSI/AWWA C110/A21.10, AWWA Standard for Ductile-Iron and Gray-Iron Fittings, Latest Revision.
- B. ANSI/AWWA C111/A21.11, AWWA Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings, Latest Revision.
- C. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.2

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.
- B. Concrete thrust blocks and mechanically restrained joints shall be required to resist thrust forces at all horizontal and vertical bends, tees and other fittings.
- C. Concrete thrust blocking shall be poured against undisturbed earth and will not bear against the backfill or bedding of another utility.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.4.

4.02 PAYMENT

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.4.4.

END OF SECTION

SECTION 333913

WASTEWATER MANHOLE FRAMES AND COVERS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Wastewater Manhole Frames and Covers in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.3.

1.02 REFERENCES

- A. ASTM A48 Standard Specification for Gray Iron Castings, Latest Revision
- B. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.3
- C. City of Frisco Standard Details for Manhole Lid and Frame

1.03 RELATED SECTIONS

- A. Section 333914 – Cast-in-Place Concrete Manholes
- B. Section 333915 – Precast Concrete Manholes

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.3.
- B. Refer to City of Frisco’s Approved Material List.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.4.
- B. All wastewater manhole covers shall be installed with inflow protection inserts.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.6.

4.02 PAYMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.6.

END OF SECTION

SECTION 333915**PRECAST CONCRETE MANHOLES****PART 1 – GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Precast Concrete Manholes in accordance with *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.

1.02 REFERENCES

- A. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections, Latest Revision
- B. *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1

1.03 RELATED SECTIONS

- A. Section 333913 – Wastewater Manhole Frames and Covers
- B. Section 330131 – Wastewater and Manhole Testing

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.1.1.
- B. A manhole-pipe connection must use water tight, size on size resilient connectors that allow for differential settlement and must conform to ASTM C923.
- C. A manhole located in a roadway or other paved area subject to vehicular traffic must meet or exceed the American Association of State Highways and Transportation Officials standard M-306 for load bearing.

PART 3 – EXECUTION

3.01 CONSTRUCTION

- A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.4.
- B. For fifteen inch (15”) to twenty-seven inch (27”) wastewater mains, the manhole shall have a minimum diameter of five feet (5’).
- C. For wastewater mains larger than twenty-seven inches (27”), the manhole shall have a minimum diameter of six feet (6’).

D. Manholes deeper than fifteen feet (15') shall have a minimum diameter of five feet (5').

E. The exterior of all concrete manholes shall be coated with bituminous waterproofing material.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.6.

4.02 PAYMENT

A. Refer to *Public Works Construction Standards*, NCTCOG, 4th Edition, Item 502.1.6.

END OF SECTION

DIVISION 34
TRANSPORTATION

SECTION 344113**INSTALLATION OF HIGHWAY TRAFFIC SIGNAL****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install a Traffic Signal in accordance with TxDOT Item 680.

1.02 REFERENCES

- A. TxDOT Items 502, 610, 636, 656, 680, 684, 686, 687, 688, 6006, and 6266
- B. TxDOT's Standard Details included in the plans.
- C. Traffic Signal Plans

1.03 RELATED SECTIONS

- A. Section 260500 – Electric Conductor
- B. Section 260501 – Electric Service
- C. Section 270500 – Conduit
- D. Section 033101 – Drilled Shaft Foundation
- E. Section 344125 – Vehicle and Pedestrian Signal Heads
- F. Section 344130 – Traffic Signal Cable
- G. Section 344135 – Ground Box
- H. Section 347113 – Barricade, Signs, and Traffic Handling

1.04 SUBMITTALS

- A. Shop Drawings for all traffic signal equipment as required by the City (5 copies).
- B. Shop Drawings for street signs (except illuminated signage) (5 copies).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Items 502, 610, 636, 656, 680, 684, 686, 687, 688, 6006, and 6266.
- B. The Contractor shall furnish and install the pedestal pole assemblies.

- C. All traffic signal mast arm pole and pedestal pole assemblies shall be powder coated. The powder coat paint shall be RAL9017 (TRAFFIC BLACK) or City approved equal.
1. All assemblies that are to be powder coated shall be hot dipped galvanized to ASTM 123 and 153 specifications. Once galvanizing is completed, all exposed surfaces shall be mechanically etched by blast cleaning to remove mill scale, impurities and non-metallic foreign materials. All surfaces visually exposed are to be coated with a urethane or Triglycidyl (TGIC) Polyester Powder to a minimum film thickness of 2.0 mils. The coating shall be electrostatically applied and cured in a gas fired convention oven by heating the steel substrate to between 350 and 400 degrees Fahrenheit.
- D. Roadway Illumination Assemblies (TxDOT Item 610):
1. Luminaire ballasts shall be rated for operation at 240 volts.
 2. Luminaire lamps for this project shall be 250 Watt Metal Halide. The luminaire housings shall be powder coated using RAL 9017 (traffic black) paint or City approved equal. The covers for the luminaries shall be a clear flat-glass insert.
 3. When luminaires are to be installed on steel mast arm poles, a separate terminal strip in the signal pole access compartment shall be provided. The terminal strip shall be 4 circuit Buchanan Type 104SN or Kulka Type 985-GP-4 CU or equivalent.
 4. Sections of TxDOT standards RID (LUM1) and RID (LUM2) that pertain to High-Pressure Sodium (HPS) specifications are not applicable to this project.
 5. The conductors from the service pole to the terminal strip shall be No. 8 XHHW wires. The conductors from the terminal strip to the luminaire shall be No. 12 XHHW wires.
- E. City Furnished Material
1. Install NEMA Controller Cabinet Assembly
 2. Install Illuminated Street Name Signs
 3. Install VIVDS Shielded Cable
 4. Install VIVDS Processor System
 5. Install VIVDS Camera Assembly
 6. Install VIVDS Set-up System
 7. Install Opticom Cable
 8. Install Opticom Detector
 9. Install Opticom Discriminator Module
 10. Install Ped Detect and Push Button Signs (2 Inch Push Button)
 11. Install count-down ped displays
 12. Install signal heads and LEDs
 13. Install electrical service pedestal panel
 14. Install traffic signal poles
 15. Install Ethernet cable for communications equipment
 16. Install Ethernet cable for PTZ camera

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Items 502, 610, 636, 656, 680, 684, 686, 687, 688, 6006, and 6266.

- B. This project shall consist of furnishing and installing all materials and equipment necessary for a complete signal system at the proposed location. In addition to these Items, the contractor shall be responsible for the following:
1. Furnishing and installing all signs for mounting on signal mast arms, pedestal poles, and existing sign posts. These signs shall be furnished in accordance with TxDOT Item 636 (subsidiary). Signs shall be mounted with ASTRO-SIGN BRAC or SIGNFIX Aluminum Channel or City approved equal. The standard street name signs shall have 12" upper case and 12" lower case lettering with clearview hwy 3w font (unless otherwise shown on the plans). Illuminated street name signs (ILSN) and mounting hardware will be provided by the City. The Contractor shall be responsible for installation of ILSN.
 2. During the 30-day test period, the Contractor shall utilize qualified personnel to respond to and diagnose all trouble calls. The Contractor shall repair any malfunctions to signal equipment supplied on the project. A local telephone number (not subject to frequent changes) where trouble calls are to be received on a 24-hour basis shall be provided to the City by the Contractor. The Contractor's response time to reported calls shall be within a reasonable travel time from a Dallas address, but not more than two (2) hours maximum. Appropriate repairs shall be made within 24 hours. The contractor shall keep a record of each trouble call reported in the log book provided by the City. The Contractor shall notify the City of each trouble call. The error log in the malfunction management unit (MMU) shall not be cleared during the 30-day test period without the approval of the City.
 3. The existing "stop" signs, shall be removed after the traffic signals are in operation and returned to the City of Frisco as noted.
 4. All Opticom Cable, opticom detectors with mounting brackets, and opticom discriminator module will be provided by the City of Frisco. The contractor shall be responsible for installing and making the opticom system operational.
 5. The City will furnish the traffic signal controller and cabinet. The contractor shall connect all field wiring to the controller assembly. The City will assist in determining how the detector loop lead-in cables are to be connected (i.e., series or parallel). The City will program the controller for operation, hook up the conflict monitor, detector units, and other equipment in the controller cabinet and turn on the controller. The contractor shall obtain the signal cabinet from the City of Frisco signal shop. When using City supplied controllers, the contractor shall have a qualified technician on the project site to place the traffic signals in operation.
 6. All VIVDS equipment including cameras, processor system, set-up system, and VIVDS cable will be provided by the City. The contractor shall be responsible for installing and making the VIVDS operational. The City will set-up VIVDS detection zones with Contractor's assistance in aiming cameras.
 7. The Contractor shall provide at least 48 hours of notice to the City for pick-up of the City supplied equipment.
 8. All nuts installed on the anchor bolts for traffic signal pole assemblies need to be installed using an air impact wrench followed by two impacts from a striker wrench.
 9. The Contractor shall install the traffic signal pole and mast arm assemblies furnished by the City.
 10. Erection of poles, luminaries and structures located near any overhead or underground utilities shall be accomplished using established industry and utility safety practices. The Contractor shall consult with the appropriate utility company and the City prior to beginning such work.
 11. The Contractor shall install the pedestrian push button assemblies furnished by the City unless otherwise noted on the plans.
 12. No extra compensation will be allowed for fulfilling the requirements stated above.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item will be measured on a Lump Sum (LS) basis.
- B. Contractor shall submit a Schedule of Values prior to beginning any work on this project.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit price for "Installation of Highway Traffic Signal." This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete this work.

END OF SECTION

SECTION 344125**VEHICLE AND PEDESTRIAN SIGNAL HEADS****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All labor, equipment, tools and superintendence necessary to furnish and install Vehicle and Pedestrian Signal Heads.

1.02 REFERENCES

- A. TxDOT Item 682
- B. TxDOT's Standard Details included in the plans.
- C. Traffic Signal Plans

1.03 RELATED SECTIONS

- A. Section 344113 – Installation of Highway Traffic Signals

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 682.
- B. City furnished vehicle and pedestrian signal heads, LEDs and backplates. Contractor shall supply the mounting hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 682.
- B. The Contractor shall install all vehicle and pedestrian signal heads, LEDs, and backplates furnished by the City of Frisco.
- C. No exposed cable or wiring will be permitted.
- D. Signal heads mounted on poles and mast arms shall be level and plumb and aimed as directed by the City.
- E. The signal head to mast arm connection must allow for adjustment about the horizontal and vertical axis
- F. All mast arm mounted signal heads shall be turned down and all other signal heads shall be covered with burlap or other material approved by the City until placed into operation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to TxDOT Item 682.

4.02 PAYMENT

A. All work performed in accordance with this Item will be paid for at the unit bid price for "Vehicle And Pedestrian Signal Heads," at the size and type specified. This price is full compensation for all labor, equipment, tools, and superintendence necessary to complete the work.

END OF SECTION

SECTION 344130

TRAFFIC SIGNAL CABLE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install a Traffic Signal Cable.

1.02 REFERENCES

- A. TxDOT Item 684
- B. TxDOT's Standard Details included in the plans.
- C. Traffic Signal Plans

1.03 RELATED SECTIONS

- A. Section 344113 – Installation of Highway Traffic Signal

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 684.
- B. Individual conductors shall be No. 14 AWG.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 684.
- B. The conductors in the Traffic Signal Cable shall be stranded.
- C. Each cable shall be identified as shown on the plans (CABLE 1, etc.) With permanent marking labels (PANDUIT TYPE PLM STANDARD SINGLE MARKER TIE, THOMAS & BETTS TYPE 5512M or equivalent) at each ground box and controller

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Refer to TxDOT Item 684.

4.02 PAYMENT

- A. Refer to TxDOT Item 684.

END OF SECTION

SECTION 344135

GROUND BOX

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Ground Boxes for Traffic Signals and/or Street Lighting.

1.02 REFERENCES

- A. TxDOT Items 421, 440 and 624
- B. TxDOT's Standard Details included in the plans.
- C. Traffic Signal Plans and/or Street Lighting Plans.

1.03 RELATED SECTIONS

- A. Section 344113 – Installation of Highway Traffic Signal

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 624.
- B. All ground boxes used for lighting shall have "LIGHTING" and "DANGER-HIGH VOLTAGE" imprinted on the cover.
- C. All ground boxes used for signals shall have "SIGNALS" and "DANGER-HIGH VOLTAGE" imprinted on the cover.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 624.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a per Each (EA) basis for each Ground Box, complete in place.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for “Ground Box,” of the size and type specified. This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete the work, including installing the the ground box and concrete apron.

END OF SECTION

SECTION 344150

SMALL ROADSIDE SIGN SUPPORTS AND ASSEMBLIES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Small Roadside Sign Supports and Assemblies.

1.02 REFERENCES

- A. TxDOT Items 421, 440, 441, 442, 445, 634, 636, 643, 644, and 656
- B. City of Frisco and TxDOT’s Standard Details included in the plans.
- C. Signing Plans

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to TxDOT Item 644.
- B. The Contractor shall provide field galvanizing and metalizing equipment, per TxDOT Item 445, at all times and shall make repairs to galvanized surfaces according to these specifications at intervals as directed by the City.
- C. Any signs required that on not detailed on the plan sheets shall be in conformance with the most recent Texas MUTCD and the “Standard Highway Sign Designs for Texas.”
- D. All small sign assemblies shall be installed as shown in the City of Frisco Standard Detail: “Sign Posts, Stop Signs, and Street Name Signs”
- E. Individual units requiring cleaning shall be washed with an approved cleaning solution to remove all grease, oil, dirt, smears, streaks, debris, and other foreign particles.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to TxDOT Item 644.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Refer to TxDOT Item 644 and as indicated in the Contract Documents.

4.02 PAYMENT

A. Refer to TxDOT Item 644 and as indicated in the Contract Documents.

END OF SECTION

SECTION 347113**BARRICADES, SIGNS, AND TRAFFIC HANDLING****PART 1 - GENERAL**

1.01 DESCRIPTION

- A. All material, labor, equipment, tools and superintendence necessary to furnish and install Barricades, Signs, and Traffic Handling in accordance with the Contract Documents.

1.02 REFERENCES

- A. TxDOT Item 502
- B. TxDOT's Standard Details included in the plans.
- C. City of Frisco's General Notes

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All traffic control devices requiring reflective sheeting shall have Type C -high specific intensity sheeting for signs with white backgrounds and Type E -fluorescent prismatic sheeting for signs with orange backgrounds.

PART 3 - EXECUTION

3.01 IMPLEMENTATION

- A. Refer to TxDOT Item 502.
- B. The Traffic Control Plan (TCP) shall be in accordance with the standard plan sheets WZ(BTS-1)-03 & WZ(BTS-2)-03 for signals, and as provided for in the latest edition of *Texas Manual on Uniform Traffic Control Devices for Streets and Highways* (TMUTCD).
- C. Barricades and warning signs, as appropriate, shall be placed at stockpiles to adequately warn motorists. At all stockpile sites that are less than 30 feet from the edge of any traveled lane, a Type III barricade shall be erected immediately in front of or at each end if required by the City. When a stockpile site equals or exceeds 100 feet in length, one object marker (OM-2HP) per 100 feet shall be placed alongside the stockpile.
- D. All traffic control signs shall be clean and legible, and maintained clean and legible throughout the construction phases.
- E. The Contractor shall plan his or her work sequence in a manner that will cause the minimum interference with traffic during construction operations. Before beginning work, the Contractor shall submit, for approval by the City, a plan of construction operations outlining in detail a sequence of work to be followed, setting out the method of handling traffic along, across, and adjacent to work.

- F. If, at any time during construction, the Contractor's proposed plan of operation for handling traffic does not provide for safe, comfortable movement, the Contractor shall immediately change its operations to correct the unsatisfactory condition.
- G. Subject to the approval of the City and in accordance with the plans, portions of this project, which are not affected by or in conflict with the proposed method of handling traffic or utility adjustments, can be constructed during any phase.
- H. During construction, the Contractor shall furnish, place, and maintain vertical panels or drums as indicated in the plans along the edge of pavements and fills in accordance with the latest edition of TMUTCD. The vertical panels shall be supplemented with lights as directed by City.
- I. Barricades and signs shall be placed in such a manner as to not interfere with the sight distance of drivers entering the highway from driveways or side streets. To facilitate shifting, barricades and signs used in lane closures or traffic staging may be erected and mounted on portable supports. The designs of these supports shall be in compliance with current TxDOT and Texas MUTCD standards and are subject to the approval of the City.
- J. The Contractor shall provide and maintain flaggers at such points and for such periods of time as may be required to provide for the safety and convenience of public travel and contractor's personnel, and as shown on the plans or as directed by the city. These flaggers shall be located at each end of the lane closure and shall be properly attired. The two flaggers shall be in two-way radio contact with each other at all times.
- K. The Contractor will not be permitted to commence work on the road before sunrise and shall arrange his work so that no machinery or equipment shall be closer than 30 feet to the traveled roadway after sunset except as authorized by the City. The Contractor must comply with the City's Noise Ordinance at all times.
- L. The Contractor shall keep traveled surfaces used in his hauling operation clear and free of dirt or other material.
- M. The use of rubber-tired equipment, licensed for operation on public highways, will be required for moving dirt and other materials along or across paved surfaces.
- N. Where the Contractor desires to move any equipment not licensed for operation on public highways on or across any pavement, the Contractor shall protect the pavement from all damage as directed by the City.
- O. No lane closures will be allowed prior to 9:00 a.m. or after 3:30 p.m., Monday through Friday unless otherwise directed by the City.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. This Item shall be measured on a Lump Sum (LS) basis or on a Monthly (MO) basis as indicated in the Contract Documents.

4.02 PAYMENT

- A. All work performed and materials furnished in accordance with this Item will be paid for at the unit bid price for “Barricades, Signs, and Traffic Handling.” This price is full compensation for all material, labor, equipment, tools and superintendence necessary to complete all work including, but not limited to, signage, barricades, flagmen, temporary pavement markers and markings, detours, and temporary pavement.

END OF SECTION

APPENDIX A
CITY APPROVED MATERIALS LIST

City of Frisco
Approved Materials List for Utilities

Contact: David Chacon (972) 292-5437

BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Air Valves						
Combination Air Valves	Distribution/ Transmission	Vent-O-Mat	RBX Series	NCTCOG 502.6.3		NSF
Combination Air Valves	Distribution/ Transmission	International Valve Marketing		NCTCOG 502.6.3		
Combination Air Valves	Sewage or Reuse Force Main	Vent-O-Mat	RGX Series	NCTCOG 502.6.3		
Combination Air Valves	Force Mains	International Valve Marketing		NCTCOG 502.6.3		
Angle Meter Valve						
Angle Meter Valve	3/4"	Ford	BA43-333W-G-NL		Comp x Meter Tail or FL	
Angle Meter Valve	1"	Ford	BA43-444W-G-NL		Comp x Meter Tail or FL	
Angle Meter Valve	1-1/2"	Ford	FV43-666W-G-NL		Comp x Meter Tail or FL	
Angle Meter Valve	2"	Ford	FV43-777W-G-NL		Comp x Meter Tail or FL	
Angle Meter Valve	3/4"	Cambridge	210NL-H3T3		Comp x Meter Tail or FL	
Angle Meter Valve	1"	Cambridge	210NL-H4T4		Comp x Meter Tail or FL	
Angle Meter Valve	1 1/2"	Cambridge	210NL-H6MF6		Comp x FL	
Angle Meter Valve	2"	Cambridge	210NL-H7MF7		Comp x FL	
Angle Meter Valve	3/4" to 2"	A. Y. McDonald	74602BQ		Comp x Meter Tail or FL	
Automatic Flush Device						
Eclipse		Kupferle Foundry	9800WC - Eclipse Warm Climate			
Water Meter Box	for Automatic Flushing Device	DFW Plastics	DFW-28128PLCIR			

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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Casing Spacers						
Raci Spacers		Raci North America, a JR Group Company	Various		Center/ Restrained	
PSI Model S		Pipeline Seal and Insulator, Inc.	S8G2, S8GN2, S12G2,S12GN2		Center/ Restrained	
Cleanouts						
Cleanout Castings		Bass & Hays	Pattern No. 339			
Cleanout Castings		Dallas Foundry	No. 349			
Cleanout Castings		Trinity Valley Iron & Steel	No. 1684			
Corporation Stop						
Plug Type	3/4"	Ford	F1000-3	AWWA C800	AWWA Taper x Comp	
Plug Type	1"	Ford	F1000-4	AWWA C800	AWWA Taper x Comp	
Plug Type	3/4"	Cambridge	302NL-A3H3	AWWA C800	AWWA Taper x Comp	
Plug Type	1"	Cambridge	302NL-A4H4	AWWA C800	AWWA Taper x Comp	
Plug Type	3/4" to 2"	A. Y. McDonald	4701T/4701-22	AWWA C800	AWWA Taper x Comp	
Ball Type	3/4"	Ford	FB1000-3-G-NL	AWWA C800	AWWA Taper x Comp	
Ball Type	1"	Ford	FB1000-4-G-NL	AWWA C800	AWWA Taper x Comp	
Ball Type	1-1/2"	Ford	FB1000-6-G-NL	AWWA C800	AWWA Taper x Comp	
Ball Type	2"	Ford	FB1000-7-G-NL	AWWA C800	AWWA Taper x Comp	
Ball Type	3/4"	Cambridge	301NL-A3H3	AWWA C800	AWWA Taper x Comp	

City of Frisco
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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Corporation Stop, continued						
Ball Type	1"	Cambridge	30INL-A4H4	AWWA C800	AWWA Taper x Comp	
Ball Type	1-1/2"	Cambridge	30INL-A6H6	AWWA C800	AWWA Taper x Comp	
Ball Type	2"	Cambridge	30INL-A7H7	AWWA C800	AWWA Taper x Comp	
Ball Type	3/4" to 2"	A. Y. McDonald	7470IBQ	AWWA C800	AWWA Taper x Comp	
Fire Hydrants						
Fire Hydrant		American Flow Control	5 1/4" Waterous Pacer	AWWA C502	Rain cap Required	NSF
Fire Hydrant		American Flow Control	5 1/4" American Darling B-84-B-5	AWWA C502	Rain cap Required	NSF
Fire Hydrant Paint (Entire Hydrant)	All Main Sizes	Themec	Series 530 Omnithane		Aluminum	
Fire Hydrant Paint (Top bonnet, lip and nozzle caps)	6" Main Size	Themec	Series 530 Omnithane		Aluminum	
Fire Hydrant Paint (Top bonnet, lip and nozzle caps)	8" Main Size	Themec	Series 2H		True Blue / Safety	
Fire Hydrant Paint (Top bonnet, lip and nozzle caps)	12" and Larger Main Size	Themec	Series 2H		Yellow / Safety	
Fire Hydrant Extension						
Fire Hydrant Extension		Match Hydrant Manufacturer	Breakaway coupler shall be located per manufacturer recommendation			
Fire Hydrant Reflector						
Fire Hydrant Reflector		Stimsonite	C88-AB		Blue	

City of Frisco
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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Fittings						
Ductile Iron Fittings		American, U.S. Pipe, Tyler Pipe, Star Pipe Products	Full Body or Compact	AWWA C110/ AWWA C153	Distribution/ Transmission	NSF
Manhole Appurtenances						
Manhole Ring and Cover	30" Opening Wastewater	ej	00147925W01	ASTM 48	Watertight- Bass and Hays is master distributor in DFW area	
Manhole Ring and Cover	32" Opening Wastewater	EJTW	NPR15-333-92		Cover with Logo	
Manhole Ring and Cover	24" Opening (Storm water)	Bass and Hays	BH400-24		Bass Fish Logo (Storm Sewer MH)	
Manhole Ring and Cover	18" Opening (Storm water)	Bass and Hays	BH 184L		Bass Fish Logo (Storm Sewer Inlet)	
Manhole to Pipe Connectors	6" to 15"	Trelleborg	Kor-N-Seal I 106/406 Series	ASTM C923	Precast Manholes	
Manhole to Pipe Connectors	18" to 48"	Trelleborg	Kor-N-Seal II 206 Series	ASTM C923	Precast Manholes	
Manhole to Pipe Connectors	8" to 48"	A-LOK Products	A-LOK Premium	ASTM C923	Precast Manholes	
Manhole to Pipe Connectors	8" to 48"	A-LOK Products	A-LOK Fiberglass Field Sleeve	ASTM C923	Cast-In-Place Manholes	
Manhole Waterproofing Material	16 mills	Carboline	Bitumastic 300M	AWWA C210	Precast / Cast-In-Place	
Pipe Material						
Ductile Iron Pipe	16" to 48"	American, U.S. Pipe, McWane	Pressure Class 150, 250, 300, 350	AWWA C151	Distribution/ Transmission	NSF
PVC Pipe	6" to 30"	Various Manufacturers	DR-14, DR-18	AWWA C900 AWWA C905	Distribution/ Transmission	NSF
PVC Pipe	6" to 15"	Various Manufacturers	SDR 26 (PS 115) SDR 35 (PS 46)	ASTM D3034	Non-pressure Wastewater	

City of Frisco
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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Pipe Material, continued						
PVC Pipe	18" to 48"	Various Manufacturers	PS 115	ASTM F679	Non-pressure Wastewater	
PVC Pipe	18" to 48"	Various Manufacturers	Closed Profile (PS 46)	ASTM F1803	Non-pressure Wastewater	
PVC Pipe	6" to 12"	Various Manufacturers	SDR 26 (Pressure rated 160 psi)	ASTM D2241	Pressure Wastewater; White in Color	
PVC Pipe	16" to 42"	Various Manufacturers	DR-25	AWWA C905	Pressure Wastewater; White in Color	
Fiberglass Pipe	18" to 72"	Hobas, Flowtite, Future	PS 46	ASTM D3262	Non-pressure Wastewater	
Polywrap						
Polyethylene Encasement	Ductile Iron Pipe and Fittings	Various Manufacturers	8 mils	AWWA C105		
Adhesive Tape	2" Wide	Polyken	Scotchrap No. 50			
Retainer Glands						
Retainer Glands	For MJ DI Pipe Up to 36"	Uni-Flange	Series 1400-D	AWWA C600 NCTCOG 502.4		NSF
Retainer Glands	For MJ DI Pipe Up to 48"	Ebba Iron	Megalug Series 1100, 1100SD	AWWA C600 NCTCOG 502.4		NSF
Retainer Glands	For MJ PVC Pipe Up to 24"	Uni-Flange	Series 1500, 1500-C	AWWA C600 NCTCOG 502.4		NSF
Retainer Glands	For MJ PVC Pipe Up to 24"	Ebba Iron	Megalug Series 2000PV	NCTCOG 502.4		NSF
Reclaimed Water Meter						
Reclaimed Water Meter	1"-6"	Neptune (sole source)			No Lead	

City of Frisco
Approved Materials List for Utilities

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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Reclaimed Water Meter Boxes						
Reclaimed Water Meter Box	1"	DFW Plastics	DFW36C-12-5BA		purple	
Reclaimed Water Meter Box	1 1/2" or 2"	DFW Plastics	DFW1730F-18-5BA		purple	
Service Saddles						
Service Saddle	3/4" to 2"	Ford	Style 202B		Brass with double bronze straps	
Service Saddle	3/4" to 2"	Cambridge	Series 810		Brass with double bronze straps	
Service Saddle	3/4" to 2"	A. Y. McDonald	Model #3825		Brass with double bronze straps	
Tapping Sleeve						
Tapping Sleeve	For DI, CI, PVC Up to 24"	Mueller	Model #H-615	AWWA C600	Gray or DI, Full Bodied	NSF
Tapping Sleeve	For DI Up to 36"	American	Series 2800	AWWA C600	DI Full Bodied	NSF
Tapping Sleeve	For CI or DI 14" to 36"	American	Series 1004	AWWA C600	DI Full Bodied	NSF
Tapping Sleeve	For DI, CI, PVC Up to 36"	U.S. Pipe	T-9	AWWA C600	DI Full Bodied	NSF
Tapping Sleeve	20" and Larger	Smith-Blair	Style 623	AWWA C600	Stainless Steel	NSF

City of Frisco
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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Valves						
Gate Valve	6" to 12" 150 psi test	Mueller	2360 Series	AWWA C509	Distribution	NSF
Gate Valve	16" to 24" 150 psi test	M&H	Style 4067	AWWA C509	Distribution	NSF
Gate Valve	6" to 16" 150 psi test	M&H	Style 7571	AWWA C515	Distribution	NSF
Gate Valve	6" to 24" 150 psi test	American Flow Control	Series 2500	AWWA C509	Distribution	NSF
Butterfly Valve	16" to 48"	Mueller	3211 Series	AWWA C504	Distribution/ Transmission	NSF
Butterfly Valve	16" to 24"	M&H	Style 4500	AWWA C504	Distribution/ Transmission	NSF
Butterfly Valve	30" to 48"	M&H	Style 1450	AWWA C504	Distribution/ Transmission	NSF
Plug Valve (Eccentric)	4" to 24"	M&H	Style 1820	AWWA C504 AWWA C505		NSF
Plug Valve (Eccentric)	4" - 20"	Dezurick	PEC	AWWA C504 AWWA C505		NSF
Plug Valve (Eccentric)	2.5" - 20"	Pratt	Ballcentric	AWWA C504 AWWA C505		NSF
Plug Valve (Eccentric)	3"-24"	Clow	F-5412	AWWA C504 AWWA C505	Flanged End	NSF
Plug Valve (Eccentric)	3"-24"	Clow	F-5413	AWWA C504 AWWA C505	M.J. End	NSF
Valve Stack						
Valve Stack	3 piece screw type	Tyler Union, PROSELECT, Star Pipe Products	Tyler Union 30U 6850, PROSELECT PSVBxxxSW, Star Pipe VB-0001		2 Piece Screw types with lid to make 3 Piece	
Valve Box Insert						
Valve Box Insert		Parsons Environmental	Valve Box Insert	ASTM D1248	5 1/4" SRC	

City of Frisco
Approved Materials List for Utilities

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BASIC PRODUCT CATEGORY	PRODUCT SUB-CATEGORY	MANUFACTURER	MODEL, TYPE, OR STYLE APPROVED	GOVERNING SPECIFICATION	NOTES	NSF 61 CERTIFIED
Water Meter AMR Lids						
Water Meter Lid	18" x 18"	DFW Plastics	DFW18 AMR -1SF 6540 FRISCO Lid	ASTM C857-95		
Water Meter Lid	20" Diameter	DFW Plastics	DFW20G-1IBT-Lid	ASTM C857-95	for Automatic Flushing Device	
Water Meter Vaults						
Domestic Meter Vault	3" to 6" Meter	Park Environmental Equipment Co.	Precast Concrete		Galvanized Steel Hatchway	
Double Detector Check Fire Meter Vault	4" to 10" Meter	Park Environmental Equipment Co.	Precast Concrete		Aluminum Hatchway	
Water Meter Boxes						
Water Meter Boxes	1"	DFW Plastics	DFW-1814F-1SF6450 FRISCO			
Water Meter Boxes	29" x 18"	DFW Plastics	DFW-2818F-1IBT		for Automatic Flushing Device	
Water Meter Boxes	1"	DFW Plastics	DFW-37C-KSBSM		Reclaimed only (Purple)	
Water Meter Boxes	1-1/2" to 2"	DFW Plastics	D1730 -18-KSBSM		Reclaimed only (Purple)	
Water Meter Couplings						
Water Meter Strainer	3"	Neptune (sole source)	53107-000		Bronze Strainer	
Water Meter Strainer	4"	Neptune (sole source)	53107-100		Bronze Strainer	
Water Meter Strainer	6"	Neptune (sole source)	52000-201		Bronze Strainer	

APPENDIX B
BNSF UTILITY CROSSING PERMIT

PIPELINE / WIRE LINE PROCESS INSTRUCTIONS

Licensing Process:

1. Once the application package is received by Jones Lang LaSalle Brokerage, Inc. (JLL), the application and drawing will be forwarded to the engineering firm to prepare the Exhibit "A" drawings for the contract. **This process takes approximately 10 to 15 working days.**
2. When the Exhibit "A" is completed, a contract will be prepared and two (2) copies will be forwarded to you for an original signature. A letter will be sent to you that will provide directions regarding insurance and any additional fees.
3. Return the signed contracts (2 contracts with original signatures), along with the appropriate **payment** to JLL's Permits Department.
4. The final contracts, with original signatures, will be presented for execution provided payment has been received and insurance has been approved.
5. Once the contract is executed, one original will be returned to you for your files.
6. Prior to commencing any work on the Premises, Licensee shall complete and shall require its contractor (all parties who will be working on the site) to complete the safety training program at Internet Website <http://www.contractororientation.com>. This training must be completed no more than one year in advance of Licensee's entry on the Premises.
7. The cover letter and the executed contract will list the Roadmaster's name and phone number. **You will need to contact the Roadmaster ten (10) days prior to beginning work.**

Process Time:

Please be advised that the average time period for completion of this process is 4 weeks from the time that the application is received. Every effort will be made to complete this process in a timely manner. If you require **RUSH** processing please complete the attached form and send with your check for \$4,250. *We cannot provide RUSH processing for longitudinals.*

Insurance Requirements for the following Agreements:

	Pipeline, Overhead Pipe Truss or Conveyor	Electric Supply, Communication or Telephone Line
Commercial General Liability Insurance	Contractual Liability with a combined single limit of a minimum of \$5,000,000 each occurrence and an aggregate limit of at least \$10,000,000.	Contractual Liability with a combined single limit of a minimum of \$2,000,000 each occurrence and an aggregate limit of at least \$4,000,000.
Business Automobile Insurance	Combined single limit of at least \$1,000,000 per occurrence.	Combined single limit of at least \$1,000,000 per occurrence.
Workers Compensation and Employers Liability Insurance	Employers' Liability with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.	Employers' Liability with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.
Railroad Protective Liability Insurance	Coverage of at least \$5,000,000 per occurrence and \$10,000,000 in the aggregate.	Coverage of at least \$2,000,000 per occurrence and \$6,000,000 in the aggregate, with the exception of New Mexico in which coverage is \$5,000,000 per occurrence and \$10,000,000 in the aggregate
Pollution Legal Liability Insurance (if necessary)	In an amount of at least \$5,000,000 per occurrence and \$10,000,00 in the aggregate	
Please Note: These limits are subject to change without notice. An Agreement will be provided to you, which contains details concerning insurance requirements.		

Please send the following so we may process your License request:

1. **Completed Application.**
2. **\$800 non-refundable processing fee.** Check should be made payable to BNSF Railway Company.
3. **One set of drawings** (no larger than 11 x 17) for the area to be occupied. (Include: streets, distance from tracks and streets, mileposts if available and any distinguishing land marks.) If required, attach the **pole head diagram**. Please ensure all information is accurate, as each change will add an additional \$800 to the processing fee.
4. If you require this be expedited please complete the **RUSH** form and include an additional non-refundable \$4,250. *We cannot provide RUSH processing for longitudinal.*

Forward to:
 Jones Lang LaSalle Brokerage, Inc.
 Attn: Permit Services
 4200 Buckingham, Suite 110
 Ft. Worth, TX 76155



APPLICATION FOR PIPELINE or WIRE LINE - CROSSING AND/OR LONGITUDINAL

Jones Lang LaSalle Brokerage, Inc. Applicants Tax ID # or SS # 75-6000531
ATTN: Permit Services
 4200 Buckingham, Suite 110
 Fort Worth, TX 76155

We submit for your approval the following specifications for a pipeline or wire line we propose to build across and/or along **BNSF RAILWAY COMPANY'S** right-of-way, as shown on the enclosed location plan and detailed sketch.

Legal name of company/municipality who will own the pipeline/ wire line: City of Frisco
 State in which incorporated: TX (If not incorporated, please attach name of owners or partners.) _____
 Name of contact for ownership entity: Jason Brodigan, P.E. Phone #: 972-292-5434
 EMail Address: jbrodigan@friscotexas.gov Fax: 972-292-5016
 Mailing Address: 6101 Frisco Square Blvd, Frisco, TX 75034

Is this project **ARRA** funded? Yes No
 Is applicant a condemning authority? Yes No
 Is applicant a Railroad Shipper? Yes No
 If yes, BNSF Marketing Rep. name: _____ Phone # _____
 Was this service requested by BNSF? Yes No
 If yes, person requesting service: _____ Phone # _____
 Is this installation in conjunction with a track or track expansion project? Yes No
 If yes, BNSF contact name: _____ Phone # _____
 Is this installation associated with a public road crossing/widening or a grade separation project? Yes No
 If yes, please provide details and plans for said crossing/widening or grade separation project with your application.

Type of Encroachment: Crossing Longitudinal Both
 Name of nearest town on RR Frisco County Denton State TX
 Name of nearest roadway crossing Lebanon Road
 RR?
 Location of Encroachment: _____ 1/4 Section _____ Township _____ Range _____
 Railroad Mile Post 688.35 Latitude _____ Longitude _____
 Within limits of public road or street? Yes No If yes, distance from center line of road: 16 ft.
 Width of public road or street: 120 ft.

PIPELINE:
 (Note: For wire line see pg. 2)

Contents to be handled through pipeline: Wastewater

	CARRIER	CASING
Length of pipe on RR property (plastic pipe must be encased full width of ROW)	110 ft.	110 ft.
Inside diameter of pipe	20 in.	32 in.
Pipe Material	Polyvinyl Chloride	Steel
Specification & grade (Minimum yield strength casing 35,000 psi)	AWWA C905 DR18	35KSI
Wall thickness (minimum wall thickness of casing pipe under 14 in. – 0.188 in E-80 Loading)	1.2 in	0.281 in
Actual working pressure	80psi	N/A
Type of Joint	Mechanical <input checked="" type="checkbox"/> Welded <input type="checkbox"/>	Mechanical <input type="checkbox"/> Welded <input checked="" type="checkbox"/>

	CARRIER	CASING
Coating	Asphaltic coating with polyethylene wrap	Coal Tar Epoxy
Distance from base of rail to top of pipe (Flammable contents, steam, water or non-flammable – minimum 5 ½ ft. under main track) (uncased gaseous products – minimum 10' under track)	Approx. 24.47 ft	Approx. 23.97 ft
Minimum ground cover on RR property (minimum 3 ft.)	7 ft	7 ft
Cathodic protection casing (flammable substance)	N/A	N/A

Type of insulators or support: Raci Casing Spacers Size: Type F/G Space: 6-10 ft
 Number of Vents (flammable substances require 2 vents) N/A Size: _____ Height Above Ground: _____

Method of Crossing:
 Jacking/Dry Bore
 (Jacking pit location min. 30 ft. from centerline of track. Pit must not be open more than 48 hrs. and must be protected when not in use.)

 Trench
 (RR to furnish flagman at applicant's expense)

 Horizontal Directional Drilling (HDD)
 (Jacking pit location min. 30 ft. from centerline of track. Pit must not be open more than 48 hrs. and must be protected when not in use.)

Does pipeline support an oil or gas well? Yes No
 If yes, distance from RR property. _____ ft. Name of well: _____

WIRE LINE:

Kind of encroachment: Electric Communication If other, describe: _____
 Type of wires/cables: _____ # of wires or cables: _____ Volts _____ Phase _____ Cycles _____
 Conduits:
 Occupied conduits: _____ Vacant conduits: _____ Total Conduits: _____
 Length of encroachment: _____ Adjacent spans: _____ ft. _____ ft.
 Appurtenances on RR Co. property: _____
 Wire clearance over or under top of rail: _____ ft. over or _____ ft. under
 If under track: kind of conduit _____ size of conduit _____
 Wire clearance over RR Co. wire lines: _____

POLES

Kind: _____ Size: _____
 Height: _____ Class: _____
 Set in: Earth Rock
 Number of poles on RR property: _____
 Distance of poles from track: _____

GUY WIRES

Overhead _____ Down _____
 Kind _____ Size _____

CROSS ARMS

Material: _____
 Size: _____ x _____ x _____

FRONT ELEVATION

INSULATORS

Material: _____

Type: _____ Size: _____

BRACKETS

Material: _____

Type: _____ Size: _____

CONDUCTORS

Material: _____

Type: _____ Size: _____

SIDE ELEVATION

LINE CHARACTERISTICS

Voltage: _____ Phase: _____ Cycle: _____

I agree that I have read the instructions for the installation of wire lines as detailed in the *Utility Accommodation Policy*.

Attached to this sheet is a location plan and a detailed sketch. Sketch should show tie-down measurement to centerline of nearest road crossing, bridge or other railroad structure.

Please authorize us to proceed with this installation or advise what changes are necessary to meet BNSF's specifications.

Date: _____

Signed: _____

Print Name: _____

Company: _____

Title: _____

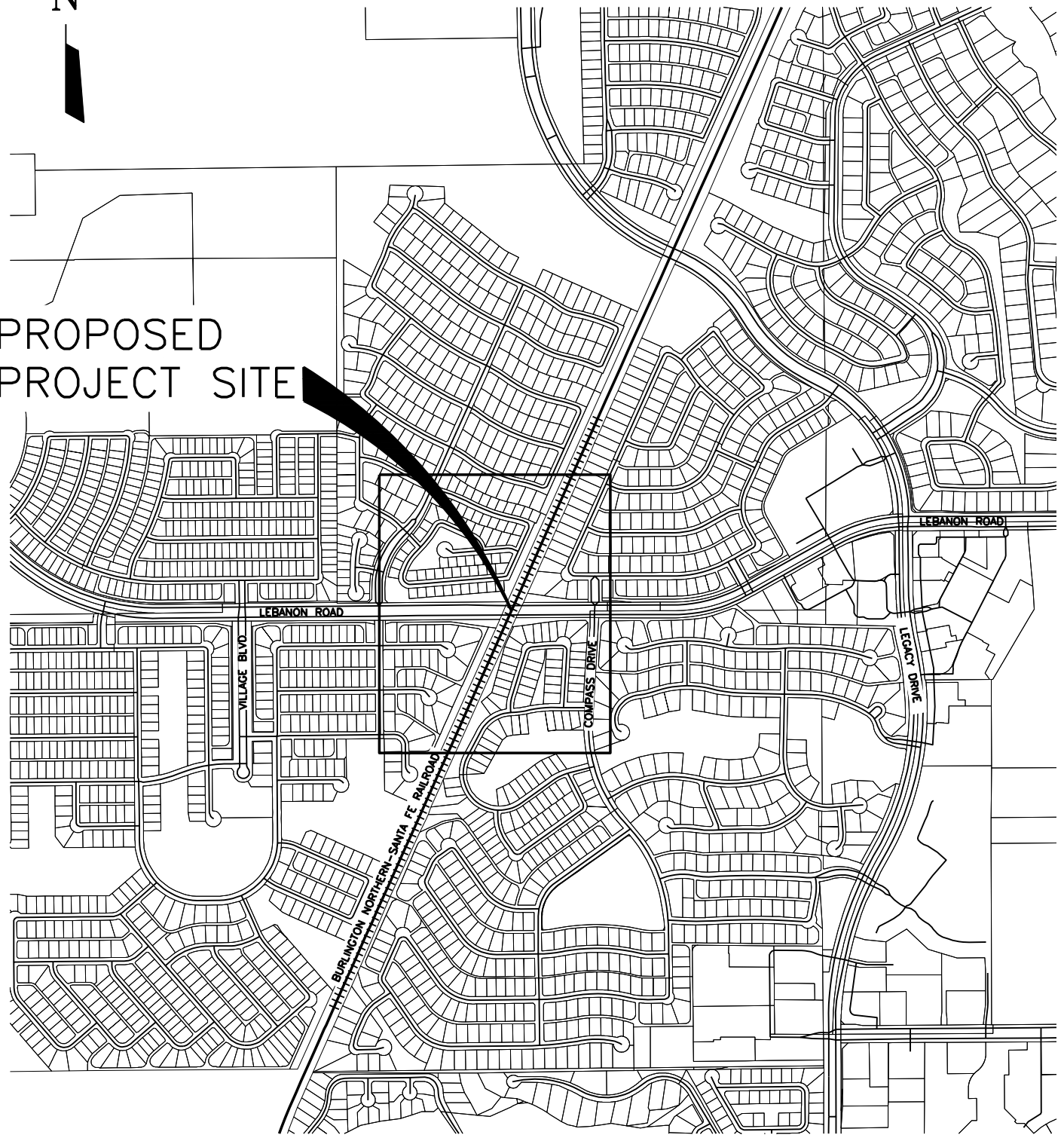
Phone #: _____ Fax: _____

If you require additional assistance, please contact your [Jones Lang LaSalle Brokerage, Inc.](#) representative.



0 1000 2000
SCALE IN FEET

PROPOSED
PROJECT SITE



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144



5805 Main Street
Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freese.com

CITY OF FRISCO, TEXAS
LEBANON ROAD LIFT STATION, FORCE MAIN,
AND GRAVITY IMPROVEMENTS - PHASE I

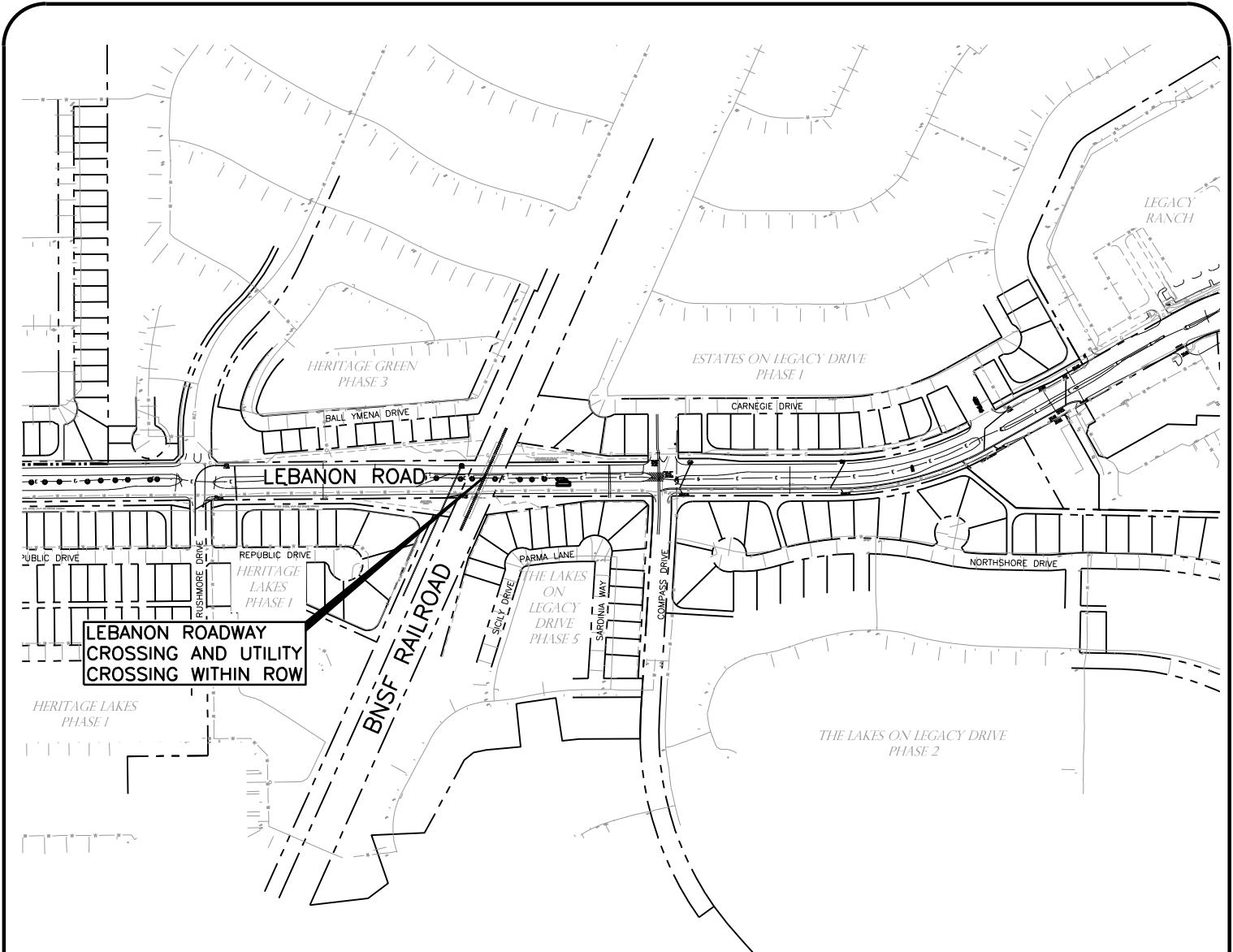
CIVIL
VICINITY MAP

EXHIBIT 1

F&N JOB NO.	FRC15624
DATE	FEB. 2017
SCALE	AS SHOWN
DESIGNED	REE
DRAFTED	LMR
FILE	VICINITY_MAP.dwg

E-1

FIGURE



**LEBANON ROADWAY
CROSSING AND UTILITY
CROSSING WITHIN ROW**



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144



5805 Main Street
Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freese.com

CITY OF FRISCO, TEXAS
**LEBANON ROAD LIFT STATION, FORCE MAIN,
AND GRAVITY IMPROVEMENTS - PHASE I**

CIVIL
PROJECT SITE

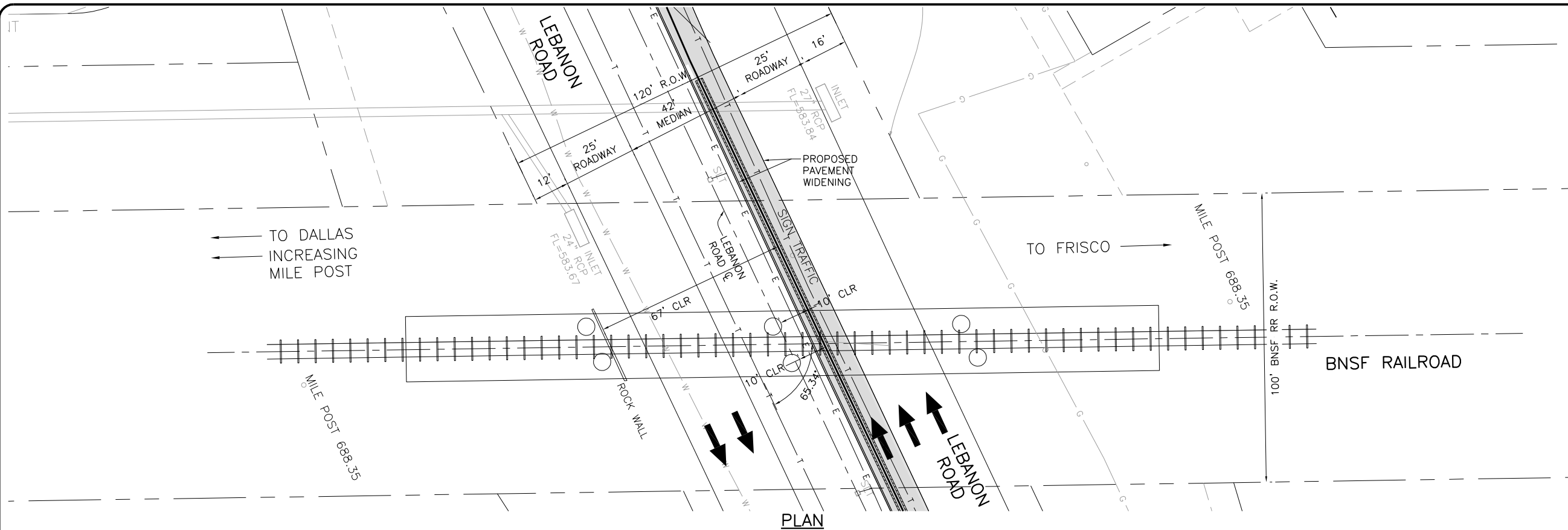
EXHIBIT 2

F&N JOB NO.	FRC15624
DATE	FEB. 2017
SCALE	1"=500'
DESIGNED	REE
DRAFTED	LMR
FILE	PROJECT SITE.dwg

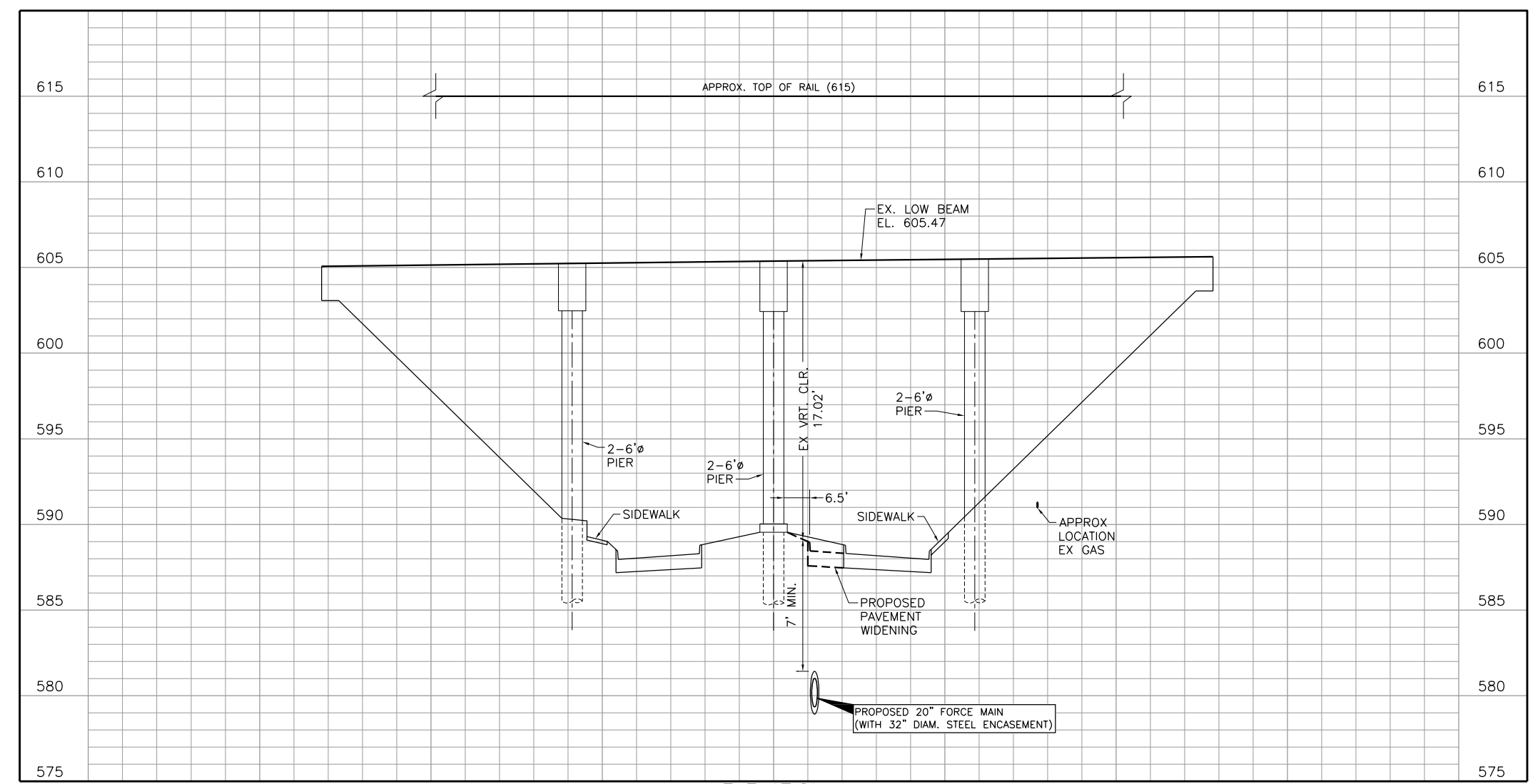
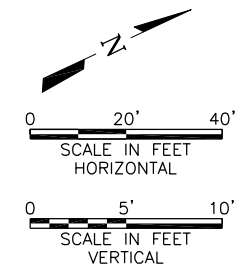
E-2

FIGURE

ACAD_Ret: 20.0s (LMS Tech)
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PLAN



ELEVATION

Freese and Nichols, Inc.
 Texas Registered Engineering Firm F-2144

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FREES & NICHOLS
 5805 Main Street
 Frisco, Texas 75034
 Phone - (972) 624-9201
 Fax - (972) 624-9202
 Web - www.freese.com

CITY OF FRISCO, TEXAS
LEBANON ROAD LIFT STATION, FORCE MAIN, AND GRAVITY IMPROVEMENTS - PHASE I

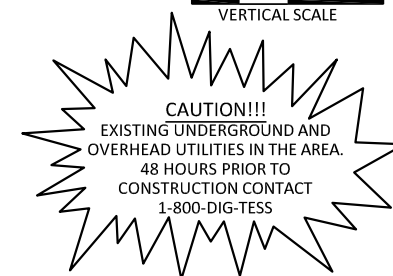
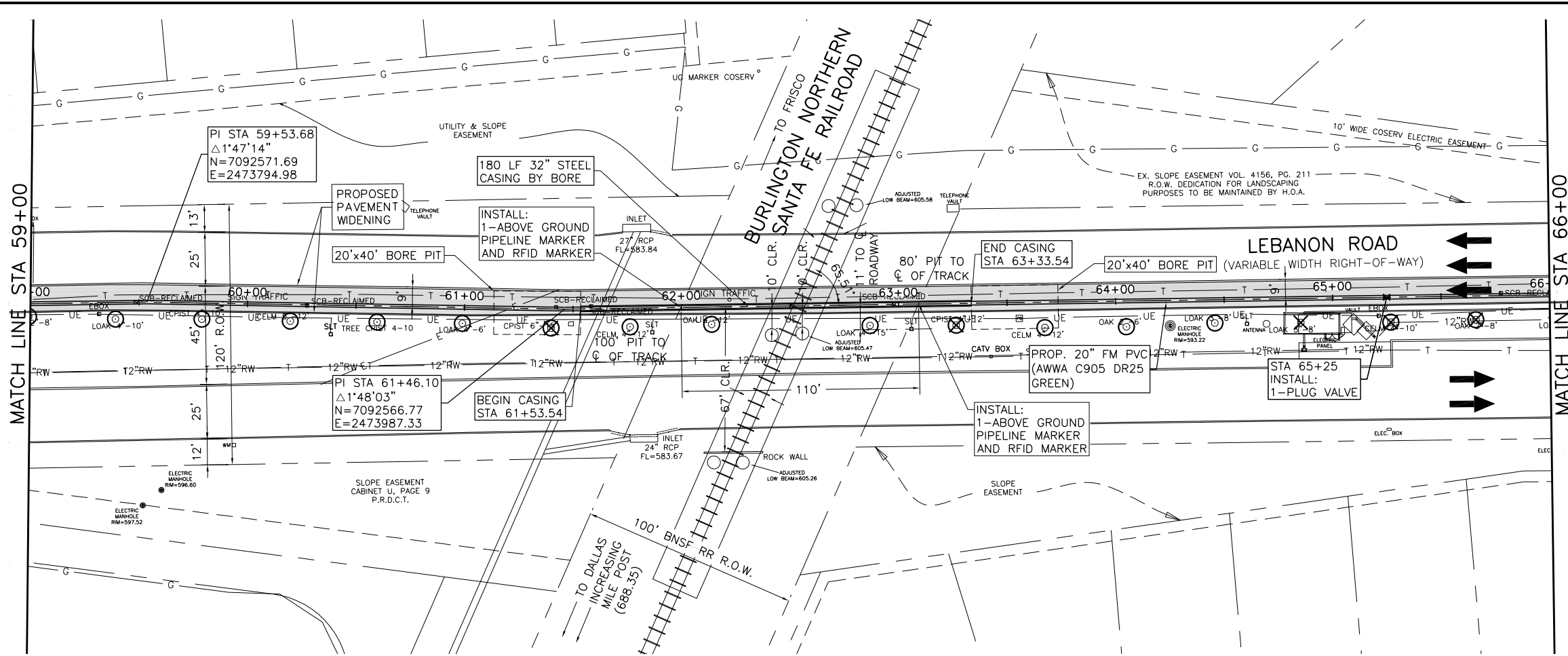
LEBANON ROAD BNSF RR BRIDGE CROSSING

NO.	ISSUE	BY	DATE	F&N JOB NO.	DATE	DESIGNED	DRAWN	REVISION	CHECKED	FILE NAME
				FRC15624	FEB. 2017	LMR	REE			WW UTIL CROSSING

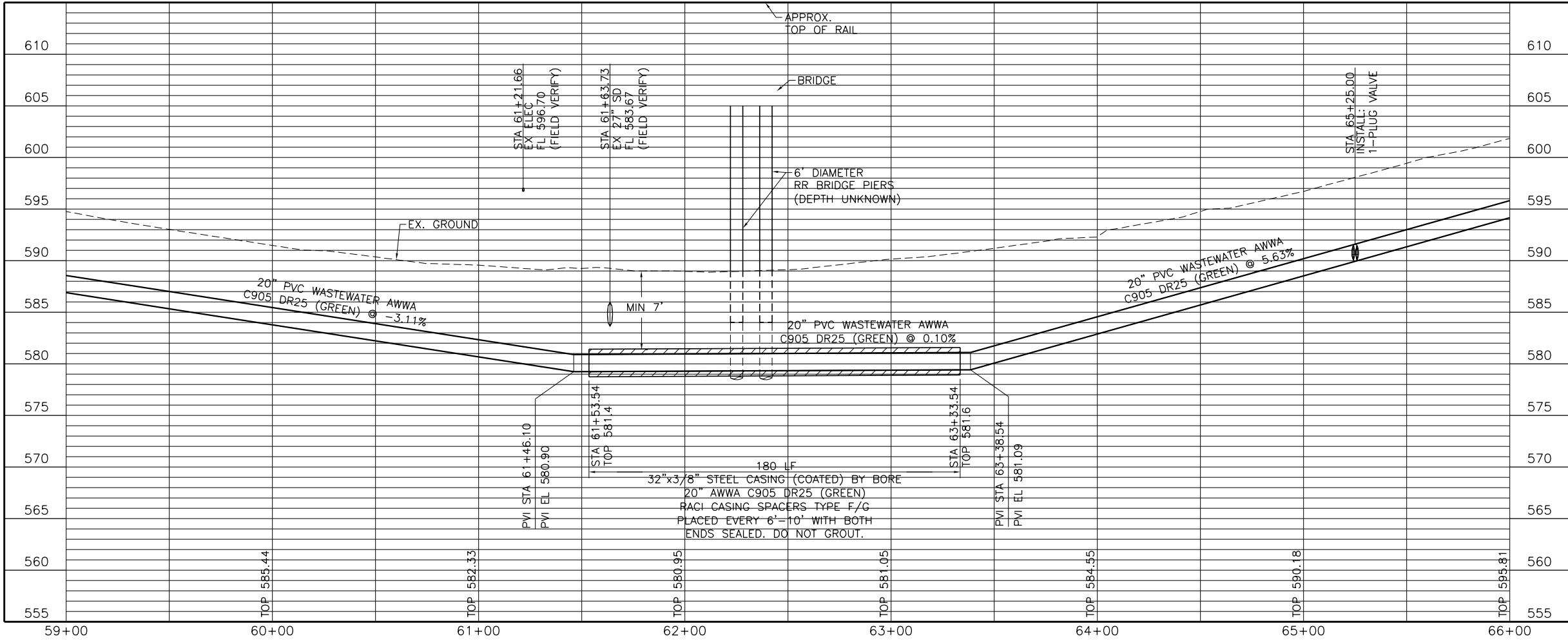
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET **EXHIB 3**

60% SUBMITTAL



NOTES:
 1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.



Freese and Nichols, Inc.
 Texas Registered Engineering Firm F-5244

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 Frisco, Texas 75034
 Phone - (972) 624-9201
 Fax - (972) 624-9202
 Web - www.freese.com

CITY OF FRISCO, TEXAS

LEBANON ROAD LIFT STATION, FORCE MAIN, AND GRAVITY IMPROVEMENTS - PHASE I

CIVIL

FORCE MAIN LINE A PLAN AND PROFILE STA 59+00 TO STA 66+00

NO.	ISSUE	BY	DATE	FRCL JOB NO.	DATE	DESIGNED	REVISION	DRAWN	REVISION	CHECKED	FILE NAME
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1	Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.										

ROADWAY SURFACING/RESURFACING PROCESS INSTRUCTIONS

Licensing Process:

1. Once application package is received by Jones Lang LaSalle Brokerage, Inc. (JLL), the application and drawing will be forwarded to the engineering firm to prepare the Exhibit "A" drawings for the contract. **This process takes approximately 10 to 15 working days.**
2. When the Exhibit "A" is completed, information will be forwarded to the local BNSF Roadmaster for approval. Once approved, a contract will be prepared and two (2) copies will be forwarded to you for an original signature. A letter will be sent to you that will provide directions regarding insurance and any additional fees.
3. Return the signed contracts (2 contracts with original signatures), along with the appropriate **payment and Certificates of Insurance** to JLL's Permit Department.
4. The final contracts, with original signatures, are presented for execution provided payment has been received and insurance has been approved.
5. Once the contract is executed, one original will be returned to you for your files.
6. Prior to commencing any work on the Premises, Licensee shall complete and shall require its contractor (all parties who will be working on the site) to complete the safety training program at Internet Website www.bnsfcontractor.com.
7. This training must be completed no more than one year in advance of Licensee's entry on the Premises.
8. The cover letter and the executed contract will list the Roadmaster's name and phone number. **You will need to contact the Roadmaster thirty (30) days prior to beginning work.**

Process Time:

Please be advised that the average time period for completion of this process is 4 weeks from the time that the application is received. Every effort will be made to complete this process in a timely manner.

Insurance Requirements for the following Agreement:

	Temporary Occupancy
Commercial General Liability Insurance	Contractual Liability with a combined single limit of a minimum of \$2,000,000 each occurrence and an aggregate limit of at least \$4,000,000.
Business Automobile Insurance	Combined single limit of at least \$1,000,000 per occurrence.
Workers Compensation and Employers Liability Insurance	Employers' Liability with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.
Railroad Protective Liability Insurance	Coverage of at least \$2,000,000 per occurrence and \$6,000,000 in the aggregate, with the exception of New Mexico in which coverage is \$5,000,000 per occurrence and \$10,000,000 in the aggregate

Note: These limits are subject to change without notice. An Agreement will be provided to you, which contains details concerning insurance requirements.

Please send the following so we may process your License request:

1. If License is for a Seismic Survey send a copy of your **Lease Agreement**.
2. **Completed Application**.
3. **\$800 non-refundable processing fee**. Check should be made payable to BNSF Railway Company.
4. **One set of drawings** (no larger than 11 x 17) for the area to be occupied. (Include: streets, distance from tracks and streets, mileposts if available and any distinguishing land marks.) Please ensure all information is accurate, as each change will add an additional \$800 to the processing fee.

Forward application and payments to:

Jones Lang LaSalle
Brokerage, Inc. Attn:
Permit Services
4300 Amon Carter Blvd.
Suite 100
Ft. Worth, TX 76155



APPLICATION FOR ROADWAY SURFACING/RESURFACING

Jones Lang LaSalle Brokerage, Inc. Applicants Tax ID # **Attn: Permit Services** or SS #

4300 Amon Carter Blvd. _____
Suite 100 _____
Fort Worth, TX 76131-2800 _____

We submit for your approval the following application for temporary occupancy on BNSF Railway Company's right of way as shown on the enclosed sketch.

Legal Name of Contractor performing work: _____
If a Corporation State in which incorporated: _____
Contact Name: _____
Mailing Address: _____
Email Address: _____
(If not incorporated, attach name(s) of owners or partners.)
Phone # _____ Fax # _____

Legal Name of Roadway Authority that will occupy the property: _____
If a Corporation State in which incorporated: _____
Contact Name: _____
Mailing Address: _____
Email Address: _____
(If not incorporated, attach name(s) of owners or partners.)
Phone # _____ Fax # _____

Is this project ARRA funded? Yes ___ No
Is this a condemning authority? Yes ___ No
Is Applicant a Railroad Shipper? Yes ___ No
If yes, BNSF Marketing Rep Name _____ Phone # _____
Was this service requested by BNSF? Yes ___ No
If yes, BNSF person requesting service _____ Phone # _____
Is this in conjunction with a track expansion project? Yes ___ No
Is the work to be performed within 50 ft. of the track? Yes No ___ ft. (x) ___ ft.
Will a crossing under the railroad tracks be required? Yes No ___
If yes, location of railroad milepost(s) _____
Percentage of project to be conducted on RR property: _____% Total Cost of Project: \$ _____

Scope of Services to be performed? _____
Name of nearest town on RR _____
Name of nearest roadway crossing RR _____
Location of proposed occupancy _____
Railroad Milepost _____

Area to be occupied: _____
Length of time for Project: _____

Attached to this sheet is a location plan and detailed sketch. Shown on the sketch are exact dimensions of the project area and distances to the centerline of the nearest track and road crossing bridge or other railroad structure.

I understand that submission of this application **does not** authorize occupancy of the property. Exact fees and insurance requirements will be forwarded after the application has been reviewed and approved by the BNSF.

Date: _____

Signed: _____

Print Name: _____

Title: _____

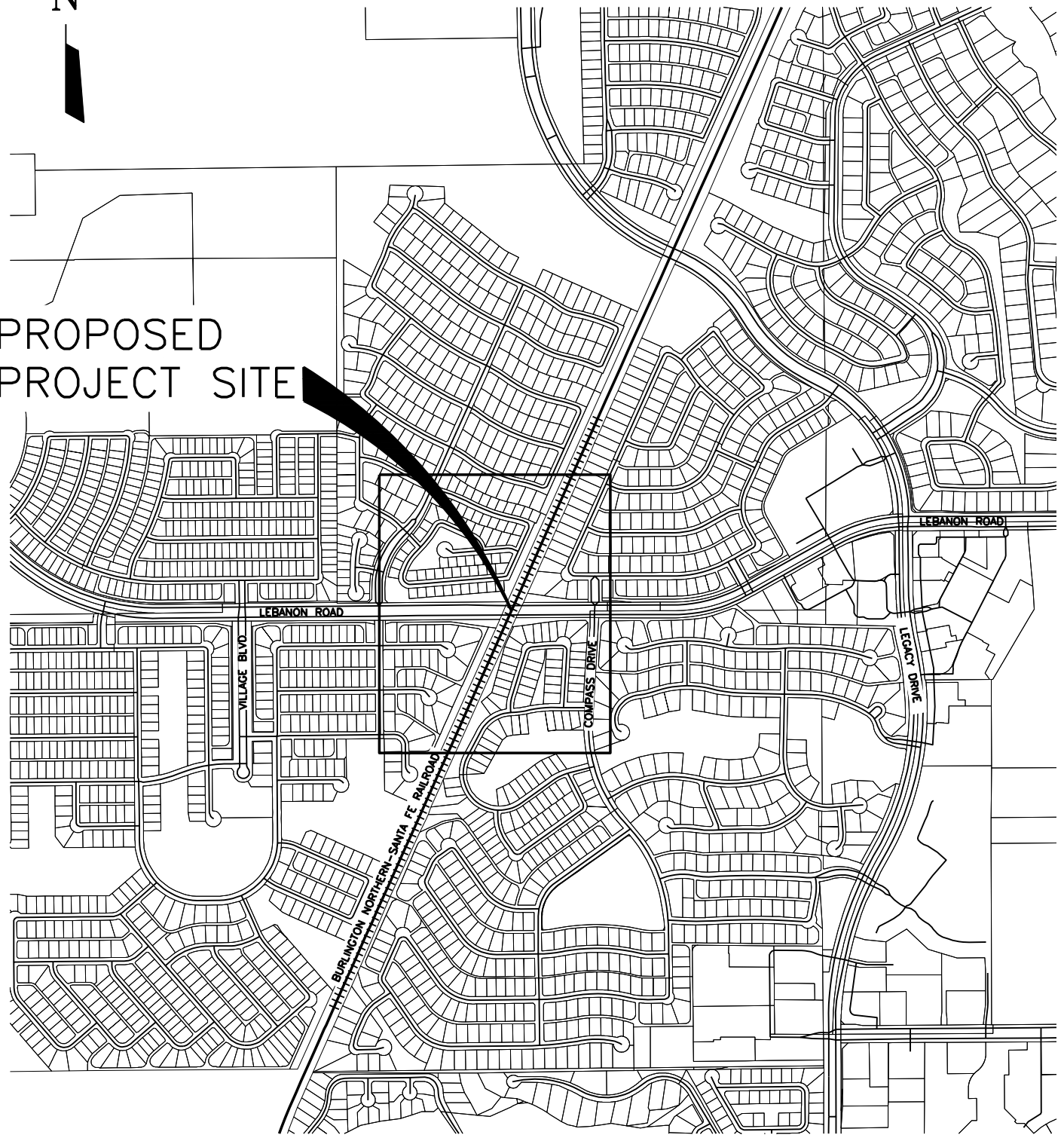
Phone #: _____ Fax #: _____

If you require additional assistance, please contact your [Jones Lang LaSalle Brokerage, Inc.](#) representative.



0 1000 2000
SCALE IN FEET

PROPOSED
PROJECT SITE



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144



5805 Main Street
Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freese.com

CITY OF FRISCO, TEXAS
LEBANON ROAD LIFT STATION, FORCE MAIN,
AND GRAVITY IMPROVEMENTS - PHASE I

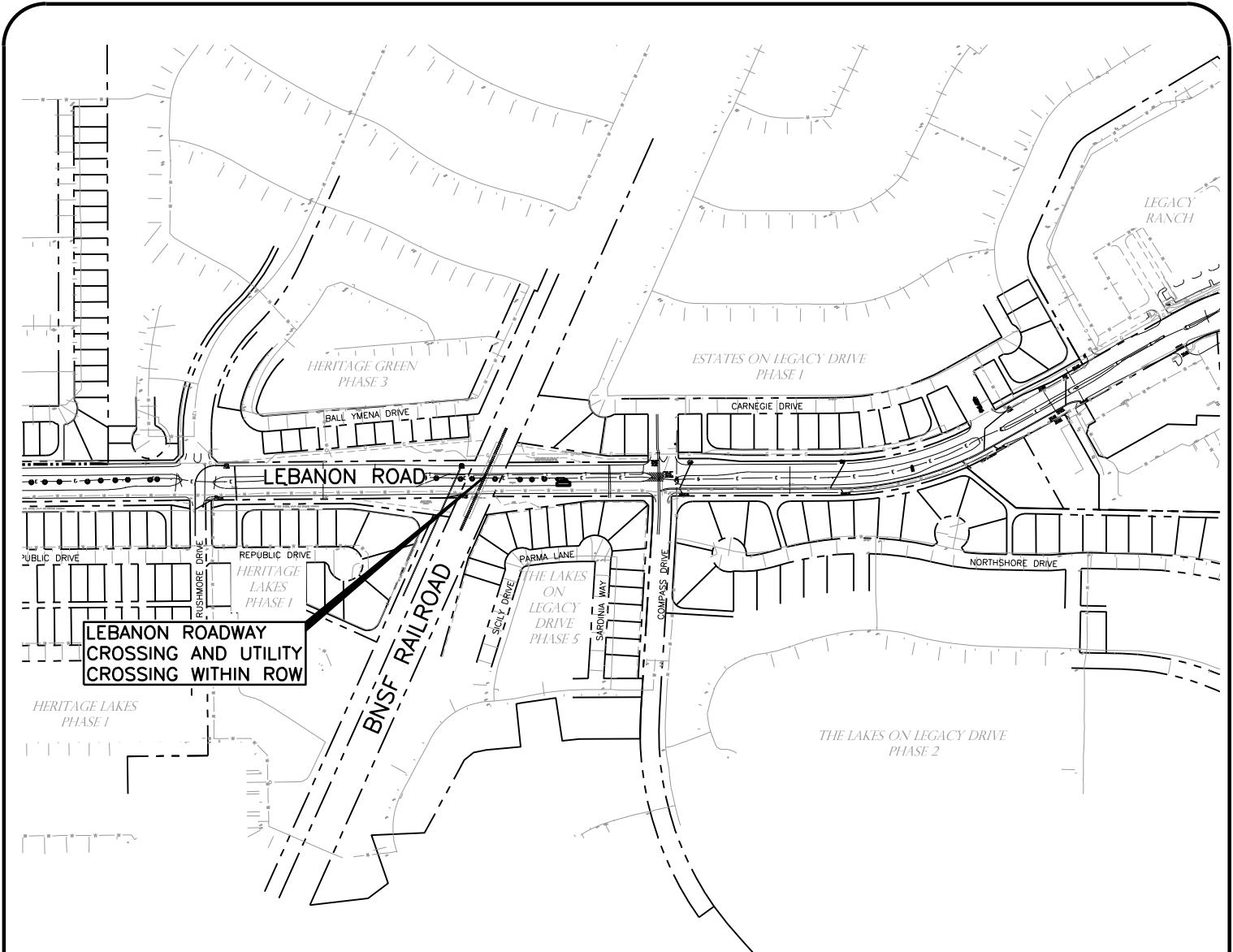
CIVIL
VICINITY MAP

EXHIBIT 1

F&N JOB NO.	FRC15624
DATE	FEB. 2017
SCALE	AS SHOWN
DESIGNED	REE
DRAFTED	LMR
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E-1

FIGURE



**LEBANON ROADWAY
CROSSING AND UTILITY
CROSSING WITHIN ROW**



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144



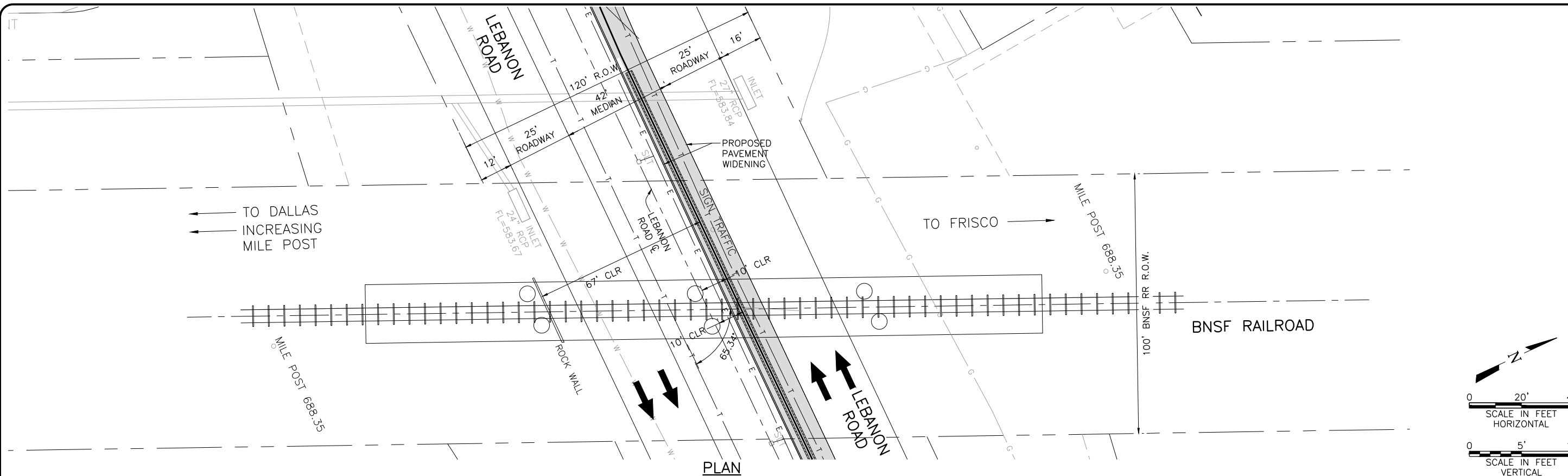
5805 Main Street
Frisco, Texas 75034
Phone - (972) 624-9201
Fax - (972) 624-9202
Web - www.freese.com

CITY OF FRISCO, TEXAS
**LEBANON ROAD LIFT STATION, FORCE MAIN,
AND GRAVITY IMPROVEMENTS - PHASE I**

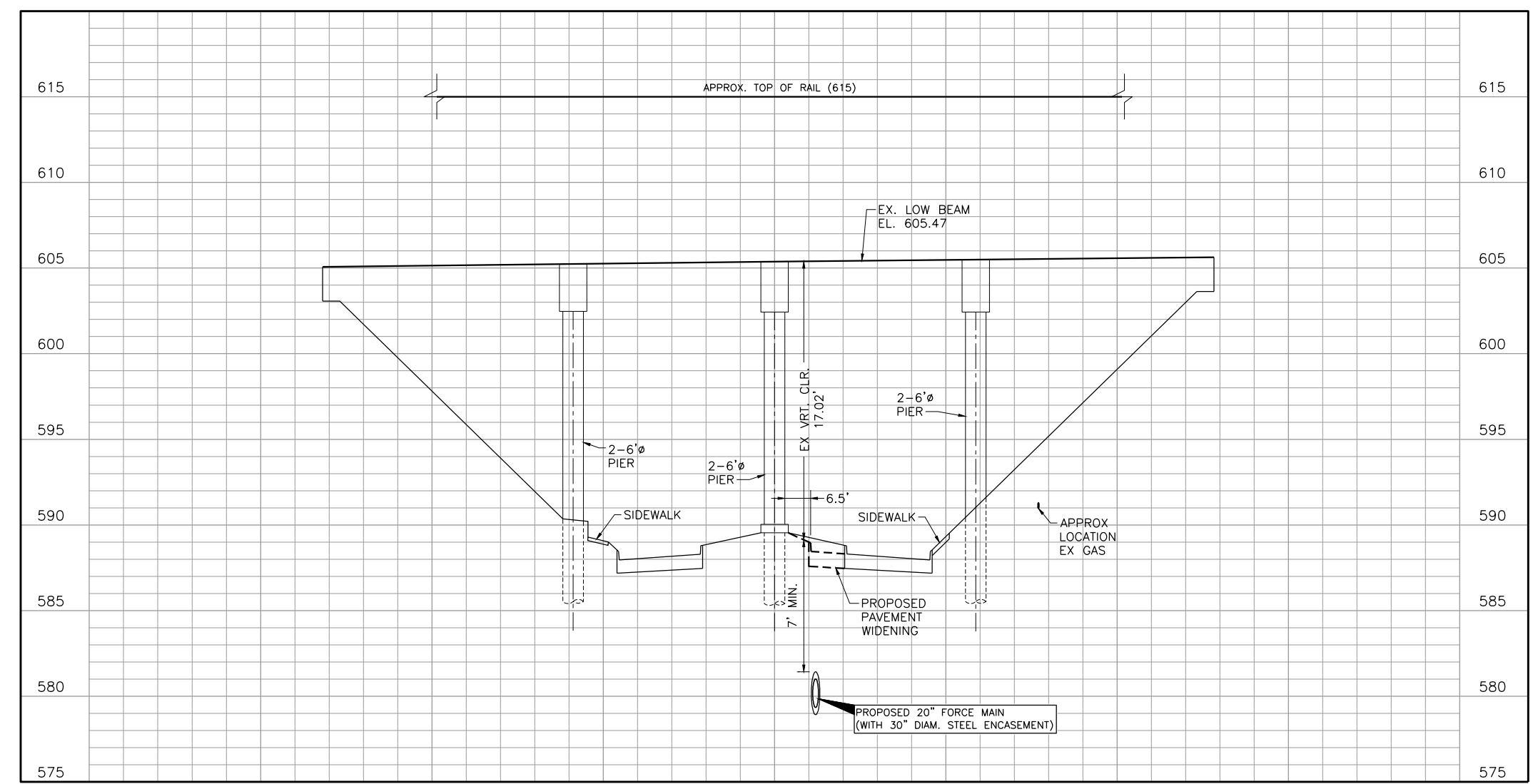
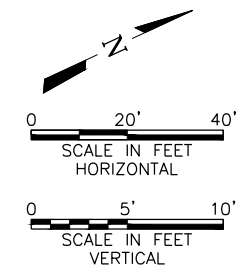
CIVIL
PROJECT SITE

EXHIBIT 2		E-2 FIGURE
F&N JOB NO.	FRC15624	
DATE	FEB. 2017	
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DESIGNED	REE	
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 Saved By: lmr



PLAN



ELEVATION

60% SUBMITTAL

Freese and Nichols, Inc.
 Texas Registered Engineering Firm F-2144

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 Freese and Nichols, Inc.
 6805 McCombs Street
 Frisco, Texas 75034
 Phone - (972) 624-9201
 Fax - (972) 624-9202
 Web - www.freese.com

CITY OF FRISCO, TEXAS
 LEBANON ROAD LIFT STATION, FORCE MAIN, AND GRAVITY IMPROVEMENTS - PHASE I

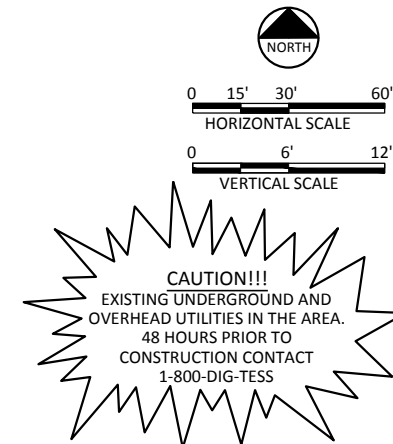
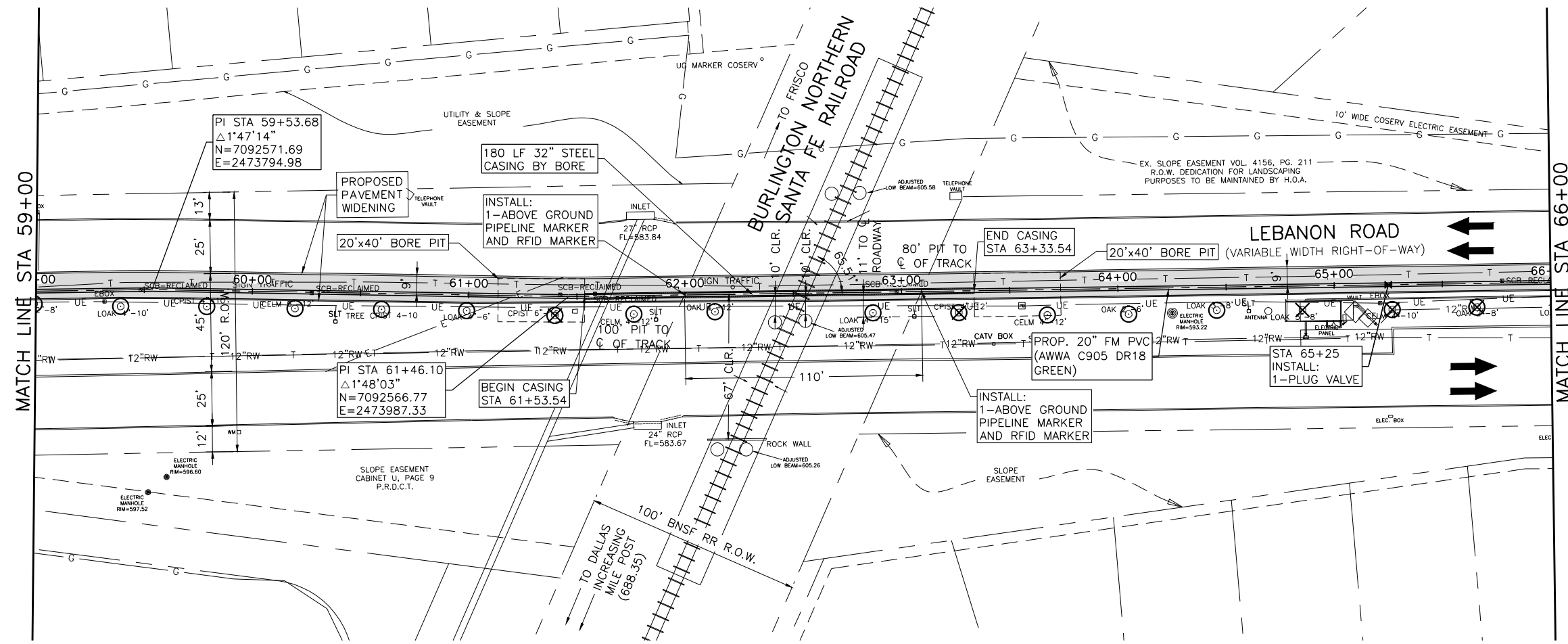
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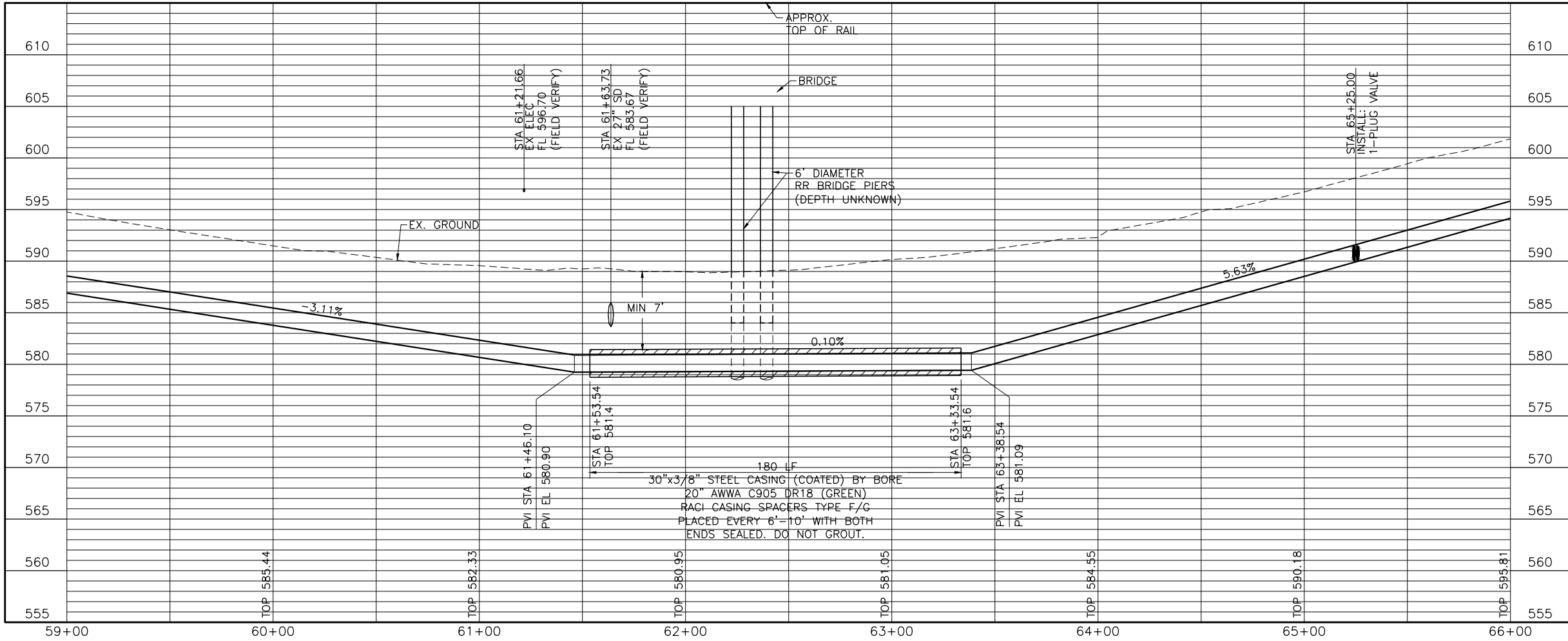
SHEET
EXHIB 3

SEQ.

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NOTES:
 1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.



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 Fax - (972) 624-9202
 Web - www.freese.com

CITY OF FRISCO, TEXAS
 LEBANON ROAD LIFT STATION, FORCE MAIN, AND GRAVITY IMPROVEMENTS - PHASE I
 CIVIL
 FORCE MAIN LINE A PLAN AND PROFILE
 STA 59+00 TO STA 66+00

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1	Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.										

60% SUBMITTAL

SHEET FM-10

APPENDIX C
GEOTECHNICAL REPORTS



Gorrondonga & Associates, Inc.

Land Surveying • Aerial Mapping • Geotechnical Engineering • Construction Materials Testing

July 23, 2015

Mr. Clayton C. Barnard, P.E.
Freese and Nichols, Inc.
6136 Frisco Square Blvd, Suite 200
Frisco, Texas 75034

GEOTECHNICAL DATA REPORT
City of Frisco Stewart Creek Reuse Improvements
Frisco, Texas
G&A Project No. 15-0253

Dear Mr. Barnard:

Gorrondonga & Associates, Inc. (G&A) is pleased to submit this Geotechnical Data Report for the above referenced project. The field and laboratory investigations were performed in general accordance with the project information provided in your recent email correspondence.

As requested, G&A traveled to the project site on July 20, 2015 to complete three soil borings within the proposed 12-inch reuse pipeline alignment. The boring location diagram and site photos are attached to this report.

Descriptions of the various strata and their approximate depths and thickness per the Unified Soil Classification System (USCS) are provided on the boring logs included as an attachment. A brief summary of the stratigraphy indicated by the borings are provided below and included on the boring logs attached to this report.

Generalized Subsurface Conditions in the area of the proposed alignment. (Boring B-01)			
Nominal Depth, feet bgs (Except as Noted)		General Description	Detailed Description of Soils/Materials Encountered
Top of Layer	Bottom of Layer		
0	20	FAT CLAY LEAN CLAY	Stiff to hard, FAT CLAY WITH SAND (CH) / LEAN CLAY WITH SAND (CL) / FAT CLAY (CH).
20	30	WEATHERED SHALE	Soft, WEATHERED SHALE.

Note: Boring Termination Depth = 30 feet bgs.

Mr. Clayton C. Barnard, P.E.
 G&AI Project No.: 15-0253
 July 23, 2015
 Page 2 of 2

Generalized Subsurface Conditions in the area of the proposed alignment. (Boring B-02)			
Nominal Depth, feet bgs (Except as Noted)		General Description	Detailed Description of Soils/Materials Encountered
Top of Layer	Bottom of Layer		
0	1	FILL	Hard, CLAYEY SAND (SC) / SANDY LEAN CLAY (CL) FILL.
1	5	WEATHERED LIMESTONE	Soft to hard, WEATHERED LIMESTONE.
5	13	LIMESTONE	Very hard, LIMESTONE.
13	45	SHALE	Soft, SHALE.

Note: Boring Termination Depth = 45 feet bgs.

Generalized Subsurface Conditions in the area of the proposed alignment. (Boring B-03)			
Nominal Depth, feet bgs (Except as Noted)		General Description	Detailed Description of Soils/Materials Encountered
Top of Layer	Bottom of Layer		
0	2	FAT CLAY	Very stiff, FAT CLAY WITH SAND (CH).
2	7	WEATHERED LIMESTONE	Hard, WEATHERED LIMESTONE.
7	30	LIMESTONE	Very hard, LIMESTONE.

Note: Boring Termination Depth = 30 feet bgs.

Groundwater Levels. The borings were advanced using auger drilling and intermittent sampling methods in order to observe groundwater seepage levels. Groundwater was not encountered during the subsurface investigation.

Please contact us if you have any questions or require additional services.

Respectfully submitted,

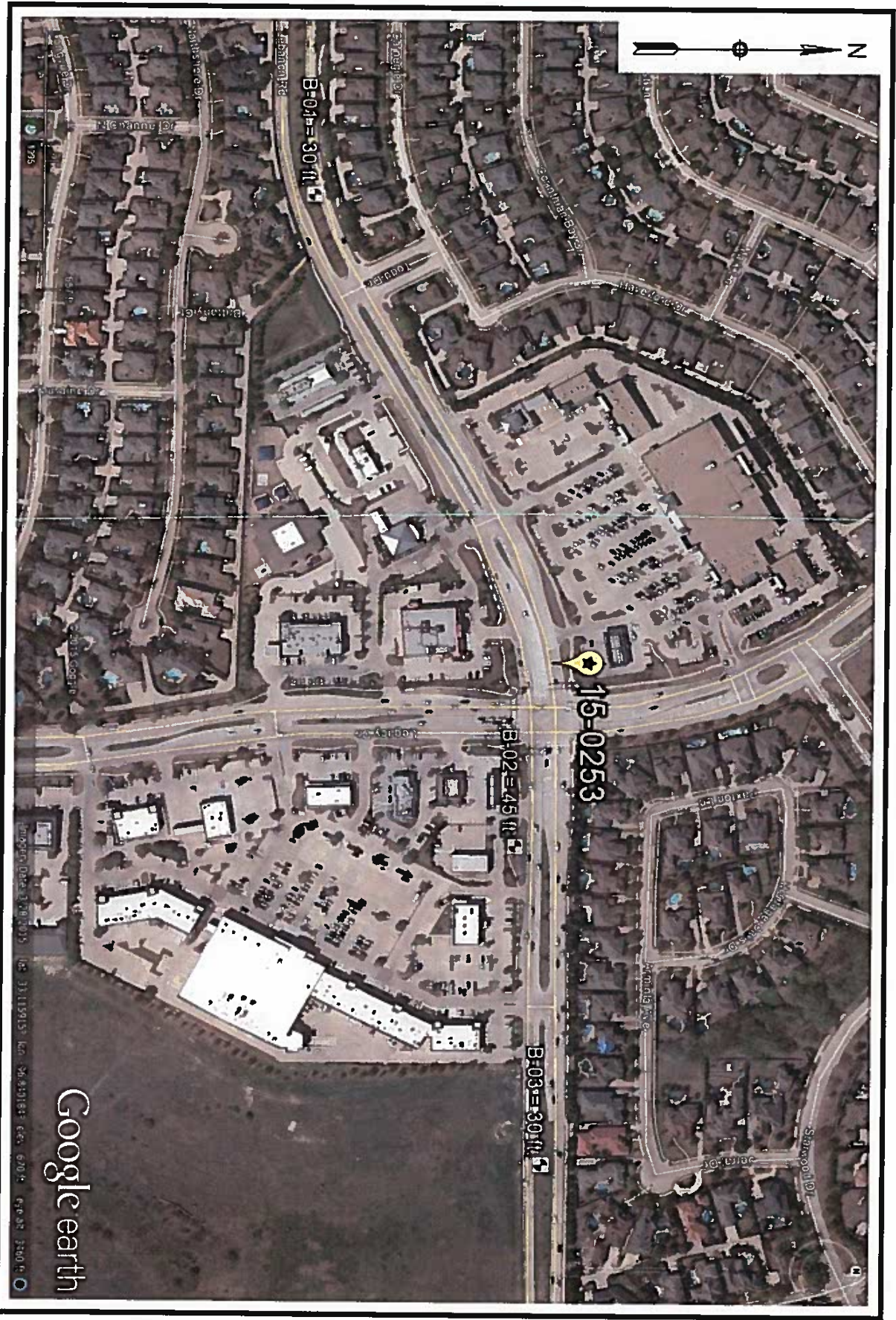


Lee Gurecky, P.E.
 Project Engineer



Attachments: Boring Location Plan, Site Photos and Boring Logs

BORING LOCATION DIAGRAM



Project No. 15-0253

City of Frisco Stewart Creek Reuse Improvements



BORING LOCATION DIAGRAM – BORING B-01

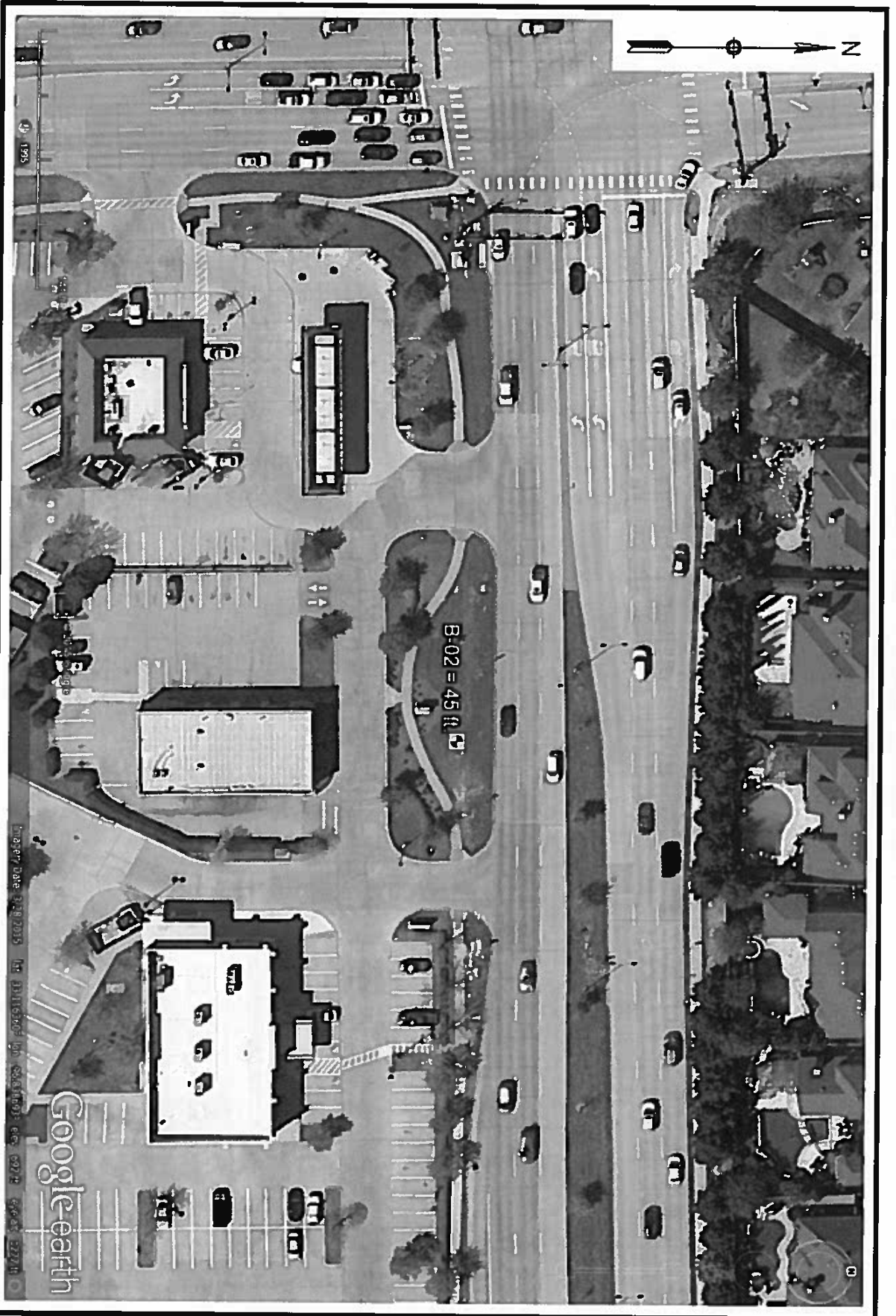


Project No. 15-0253

City of Frisco Stewart Creek Reuse Improvements



BORING LOCATION DIAGRAM – BORING B-02



Project No. 15-0253

City of Frisco Stewart Creek Reuse Improvements



BORING LOCATION DIAGRAM – BORING B-03



Project No. 15-0253

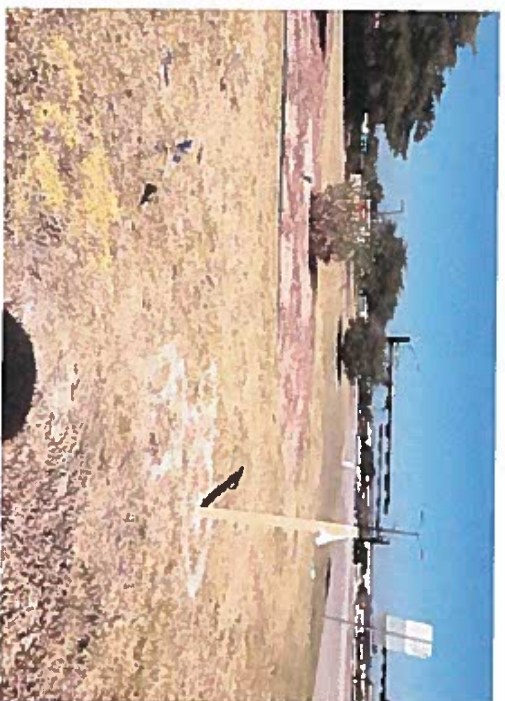
City of Frisco Stewart Creek Reuse Improvements



SITE PHOTOGRAPHS



Facing East at Boring B-01



Facing West at Boring B-02



Facing East at Boring B-03



Facing East at Boring B-03



Gorronдона and Associates
 11710 North Freeway, Suite 700, Houston, TX 77060
 7524 Jack Newell Blvd. S., Fort Worth, TX 76118
 Telephone: HOU 281-469-3347; FW 817-496-1424
 Fax: HOU 281-469-3594; FW 817-496-1768

BORING NUMBER B-01

CLIENT Freese and Nichols PROJECT NAME City of Frisco Stewart Creek Reuse Improvements
 PROJECT NUMBER 15-0253 PROJECT LOCATION Frisco, Texas
 DATE STARTED 7/20/15 COMPLETED 7/20/15 GROUND ELEVATION _____ HOLE SIZE _____
 CONTRACTOR StrataBore GROUND WATER LEVELS:
 METHOD Continuous Flight Auger INITIALLY ENCOUNTERED Not Encountered
 LOGGED BY DK CHECKED BY LG AFTER 15 MIN. Not Encountered
 NOTES _____ END OF DAY Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	TCP	RECOVERY % (ROD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	TORVANE (tsf)	Compressive Strength (tsf)	Confining Pressure (psi)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT
													LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0																
0-4		FAT CLAY WITH SAND (CH) - Hard, dark gray, with roots.	ST				4.50+									
4-5			ST				4.50+						78	21	57	8
5-8		LEAN CLAY WITH SAND (CL) - Very stiff, gray, tan and reddish brown, with calcareous seams and nodules.	ST				3.25									
8-10			ST				3.25						42	16	26	
10-13		FAT CLAY (CH) - Stiff to hard, gray and tan, with calcareous nodules.	ST				2.25									
13-15		Shaley below 13 feet.														
15-16			ST				3.00						69	25	44	92
16-20																
20-21			ST				4.50+									
21-22		WEATHERED SHALE - Soft, dark gray.	TCP	22(6") 27(6")												
22-25																
25-26			TCP	50(5.75") 50(3.5")												
26-30																
30		Bottom of hole at 30.0 feet.	TCP	50(5.75") 50(3.75")												

TCP TEMPLATE REVISED 15-0253.GPJ TCP DATA TEMPLATE.GDT 7/23/15



Gorronzona and Associates
 11710 North Freeway, Suite 700, Houston, TX 77060
 7524 Jack Newell Blvd. S., Fort Worth, TX 76118
 Telephone: HOU 281-469-3347; FW 817-496-1424
 Fax: HOU 281-469-3594; FW 817-496-1768

BORING NUMBER B-01

CLIENT Freese and Nichols PROJECT NAME City of Frisco Stewart Creek Reuse Improvements
 PROJECT NUMBER 15-0253 PROJECT LOCATION Frisco, Texas
 DATE STARTED 7/20/15 COMPLETED 7/20/15 GROUND ELEVATION _____ HOLE SIZE _____
 CONTRACTOR StrataBore GROUND WATER LEVELS:
 METHOD Continuous Flight Auger INITIALLY ENCOUNTERED Not Encountered
 LOGGED BY DK CHECKED BY LG AFTER 15 MIN. Not Encountered
 NOTES _____ END OF DAY Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	TCP	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	TORVANE (tsf)	Compressive Strength (tsf)	Confining Pressure (psi)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT
													LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		CLAYEY SAND (SC) / SANDY LEAN CLAY (CL) FILL - Hard, brown and tan.	ST													
		WEATHERED LIMESTONE - Soft to hard, tan and gray, with clay seams.	SS			50/3"										
		LIMESTONE - Very hard, gray.	TCP	50(1") 50(0.25")												
10			TCP	50(0.75") 50(0.25")												
		SHALE - Soft, dark gray.	ITCP	50(4") 50(6")												
20			ITCP	50(4.5") 50(2.5")												
			TCP	50(3.25") 50(3.50")												
30			ITCP	50(5.25") 50(3.75")												
			TCP	50(2") 50(1.5")												
40			ITCP	50(4.75") 50(3.5")												
		Bottom of hole at 45.0 feet.	ITCP	50(3.25") 50(0.25")												

TCP TEMPLATE REVISED 15-0253.GPJ TCP DATA TEMPLATE.GDT 7/23/15

Mailing Address:
P.O. Box 154551
Irving, TX 75015-4551

GLENN TRACY, P.E.
Consulting Engineer
Firm Registration # F-002575
(972) 254-4873 (office)
glenn.tracy@verizon.net (e-mail)

Office Address:
1400 W. Irving Blvd, Suite 404
Irving, TX 75061

October 8, 2012

City of Frisco
Attn: Paul Knippel, P.E., Director of Engineering Services
6101 Frisco Square Blvd, 3rd Floor
Frisco, TX 75034
pknippel@friscotexas.gov

Re: Engineering Consultation: Slope Remediation Concept Development
Lebanon Road @ BNRR (SEQ)
Frisco, TX
GTPE Project 2012043

Dear Paul:

Forensic investigations, analysis of structural adequacy, and development of remediation concepts have been completed for the failing slope paralleling Lebanon Road east of the BNRR crossing (Mapsc0 D455W). Slopes varied up to approximately 20 feet high with 2½:1 slope magnitudes, locally included a mid-slope positioned bagwall, and supported a masonry screen/retaining wall at the top. The reviewed slope extended along the south side of Lebanon Road approximately 350 LF between the BNRR R.O.W. to the west and a utility vault structure to the east.



Executive Summary

The observed slope has structurally failed but has not yet collapsed. Unabated, collapse is believed inevitable. A timeline for ultimate collapse cannot be estimated. Until that time, further lateral movements are expected. Remediation should extend the full length of the slope.

Recommended remediation is to remove and replace existing failed slope soils (encompassing the existing bagwall), and reconstruct a new taller retaining wall at the toe of the slope in order to lower the slope magnitude. Conceptually, this new structure would be a composite mortared stone gravity mass retaining wall with geogrid reinforced embankment. This remediation concept is preliminary only and does not include constructability evaluations.

Thank you for the opportunity to provide my professional services. Please feel free to contact me if you have questions or need further assistance.

Sincerely,

Glenn Tracy, P.E.

The seal appearing on this document was authorized by Glenn Tracy, P.E. on October 8, 2012.

Forensic Engineering Scope

Per your verbal request, this analysis has been focused to define a single repair concept for the failed slope at the southeast quadrant of Lebanon Rd at BNSF railroad crossing in Frisco. If possible, repair concepts were requested to be limited to non-specialized type contractor efforts. Preliminary remediation limits were additionally defined as between BNRR R.O.W. to the west and a utility vault structure to the east.

Proposed forensic engineering scope of work was to generally include:

1. Preliminary Consultation - Concept Development and Slope Remediation Recommendations.
2. Review/adaptation of Geotechnical Investigation and Global Slope Stability Analysis.
3. Review/adaptation of Topographic/Feature Land Surveying.
4. Production of Concept Construction Plans, Details, and Specifications.

Forensic engineering efforts:

- Coordinated with professional surveying, geotechnical investigations and engineering
- Integrated survey data and geotechnical strength characteristics and recommendations
- Forensically analyzed applied load and structure support characteristics
- Developed an opinion of best value remediation concept

Feature Land Surveying

Surveying efforts provided three-dimensional topographic survey and data. Documented points included the curb and gutter along the edge of street, sidewalk at the base of the slope, screen wall at the top of the slope, retaining walls positioned mid-slope, and the BNRR right-of-way (R.O.W.). Geometry data is shown graphically in the attached remediation concept plan view drawing and in AutoCAD electronic files. Surveying data was provided by Dunaway Associates on behalf of the City of Frisco.

Geotechnical Investigation

Geotechnical efforts sampled in-situ soils from a single boring extended to a depth of approximately 41 feet, determined engineering properties by performing laboratory tests on appropriate samples, and performed engineering analysis to develop recommendations for slope remediation. Geotechnical engineering study for slope remediation was provided by CMJ Engineering on behalf of the City of Frisco. A copy of the provided report is attached for reference.

Visual Observations

Review of the structure began with an on-site general characterization of the structures on-site. Visual observations noted time dependent characteristics:

- Distinct downward overall slope migration
- Soil migration towards/onto the sidewalk
- Continual moisture weeping onto the sidewalk
- Perceived bagwall outward rotation and lateral/vertical translation
- Outward rotation and downward migration of trees on the slope
- Soil separation from the screen wall and upper retaining wall
- Apparent deteriorating of brickwork on the screen wall

Time variable pictures with written descriptions of typical examples of these observations are attached in the appendix.

Analysis

CMJ Engineering's geotechnical analysis described a relative surficial slope failure that initially seems technically straight-forward to remediate. Their remediation recommendations included:

Option 1 (remove and replace failed soil with better) is a very reasonable technical solution, but complicated by logistic complexity of limited on-site work space and staging area. This is exacerbated by your statements that at most only the outside street lane likely might be closable for construction, but even then closed for only part of the day. Site access limitations likely require an equipment and staging area at the base of the slope at a minimum for demolition efforts. Minimum staging areas closely parallel minimum likely retaining wall structure section dimensions (see narrative below) making Option 1 moot.

Option 2 (remove and rework/reinforce failed soil) also appears a very reasonable technical solution but suffers from even worse logistic complexities because on-site stockpiling of excavated soil is not possible.

With either option, slope failure zones encompass the bagwall located mid-slope requiring its removal and replacement. Retaining walls located in the middle or upper limits of slopes are inherently inefficient. This is especially true of steeper slopes with lower strengths soils typical at this location. More efficient retaining wall relocation to the toe of the slope (Option 3) becomes essentially inevitably.

Option 3's additional recommendation to flatten the slope recognizes that in-situ soils are viable with shallower slope magnitudes. This again is a technically reasonable use of the soil but may offer limited added value here because the soil must be still be removed to/returned from off-site storage because of limited on-site work space and staging areas during demolition and reconstruction. Reducing the supported slope does simplify retaining wall structure requirements, and additionally improves upon the current subjectively poor maintainability of the very steep slope.

Option 4 (essentially soil nailing) is a specialized structure type requiring specialized contractors and equipment, may still not be viable without improved access, and likely would still require bagwall removal and replacement/relocation.

Remediation Options

The best value slope remediation option is believed to be a composite of Options 1-3. Soils in the failed slope zone (beginning with an access ramp extending the full length of the site and encompassing bagwall removal) would be removed and either disposed or stored off-site. A retaining wall (concept is a mortared stone veneer with integral geogrid embankment reinforcement – i.e. Mechanically Stabilized Earth or MSE structure type) would be constructed in the access ramp footprint. In-situ soils are not believed adequate for the structural soil backfill and improved borrow importation would be required. If a large, nearby storage area is available, some of the excavated soils could be reused for the embankment's slope construction above the new retaining wall. Alternately, improved quality soil replacement could be used throughout.

Construction details inherent in this composite option would additionally benefit the reconstructed slope's soil behavior by integrating necessary embankment moisture collection and drain features (beyond the scope of this concept development effort). Selection of a mortared stone variant for the MSE face veneer facilitates use of commonly available retaining wall contractor resources, and subjectively integrates better aesthetically with

neighboring retaining wall structures. Utilities are known present in the remediated slope zone but are currently not specifically defined (location and relocation beyond the scope of this concept development effort).

Summary of Estimated Structures

Preliminary concept structure design efforts estimate retaining wall:

- Lengths = 350 LF (including doglegs at each end)
- Heights = 6½ FT (maximum visible, height varies)
- Embedments = 3 FT (below sidewalk to SHALE, gray, soft as described by CMJ)
- Geogrid Lengths = 8 FT (determined with final engineering and design)
- Supported Slopes = 4:1 (horizontal:vertical)
- Concrete swale along the entire top of retaining wall (T.O.W.), slope to drain inlet structures, drain outflow to be coordinated with City during final engineering and design
- Utilities are known present in the slope zone to be remediated, utility location and relocation to be coordinated during final engineering and design

Development of final engineering and construction plans and specifications for these or other options is beyond the scope of this forensic investigation. These services could be additionally provided if requested.

Miscellaneous Additional Comments

The proscribed limits of this analysis and associated remediation concept development effort was restricted to a failed slope extending along the south side of Lebanon Road between the BNRR R.O.W. to the west and a utility vault structure to the east. Obvious additional slope failures are present on the west side of the BNRR overpass, and believed possibly present to the east of the utility vault structures. Neither of these areas is included in this analysis or report but both are recommended considered for possible inclusion with necessary remediation efforts.

NO WARRANTY, EXPRESSED OR IMPLIED, IS MADE OR INTENDED AND THE LIMIT OF LIABILITY SHALL BE LIMITED TO THE FEE PAID FOR THIS OPINION. NO FURTHER AGREEMENT SHALL BE MADE, ALTERED, OR VARIED EXCEPT BY WRITTEN INSTRUMENT. THIS REPORT IS INTENDED FOR THE SOLE USE OF THE CLIENT (ADDRESSEE) AND IS NOT TO BE USED BY ANY THIRD PARTY.

- Attachments:
- Pictures With Descriptions
 - Concept Remediation Location Plan View
 - Concept Remediation Typical Section



Reviewed slope circa September 10, 2010.

Reviewed slope circa May 28, 2010. Moisture weeping has been observed essentially continuous over time. Silt fence installation appeared intended to limit soil migration onto the sidewalk.



Reviewed slope circa May 28, 2010. Multiple iterations of bagwall construction appeared present.

Top of slope circa
September 29, 2010.
Slope downward
migration is apparent in
gapping from the base
of the wall.



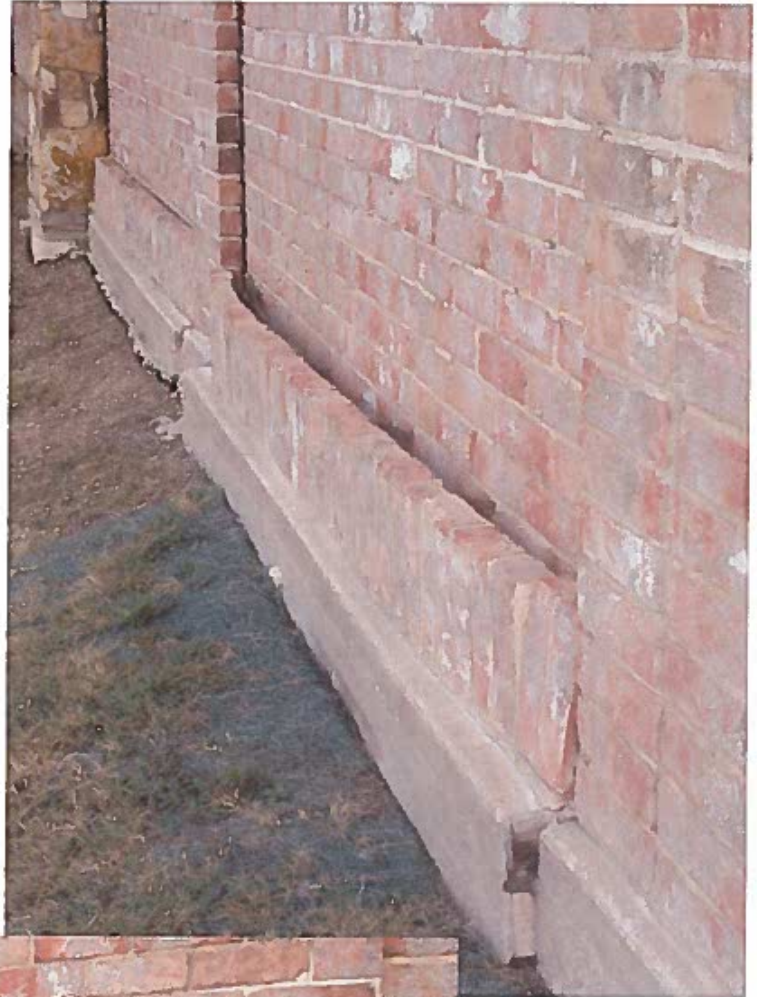
Top of slope circa
September 29, 2010.
Top of slope slip failure
readily apparent.

Retaining wall at east end of reviewed slope circa November 3, 2010. Slope downward migration is apparent in gapping at the base of the wall.



Retaining wall at east end of reviewed slope circa November 3, 2010 viewed along wall alignment. Long-term slope downward migration is apparent with outward rotation of trees on the slope.

Masonry screen wall mow strip at top of reviewed slope circa November 3, 2010. 'Floating' mow strip between pier supported pilasters showing significant rotation and translation with reduction in support from slope below.

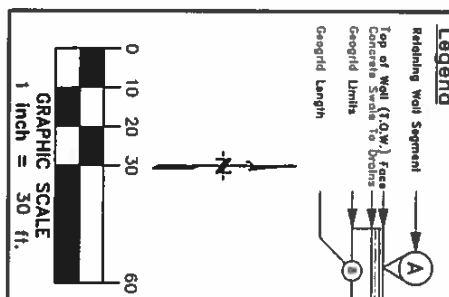
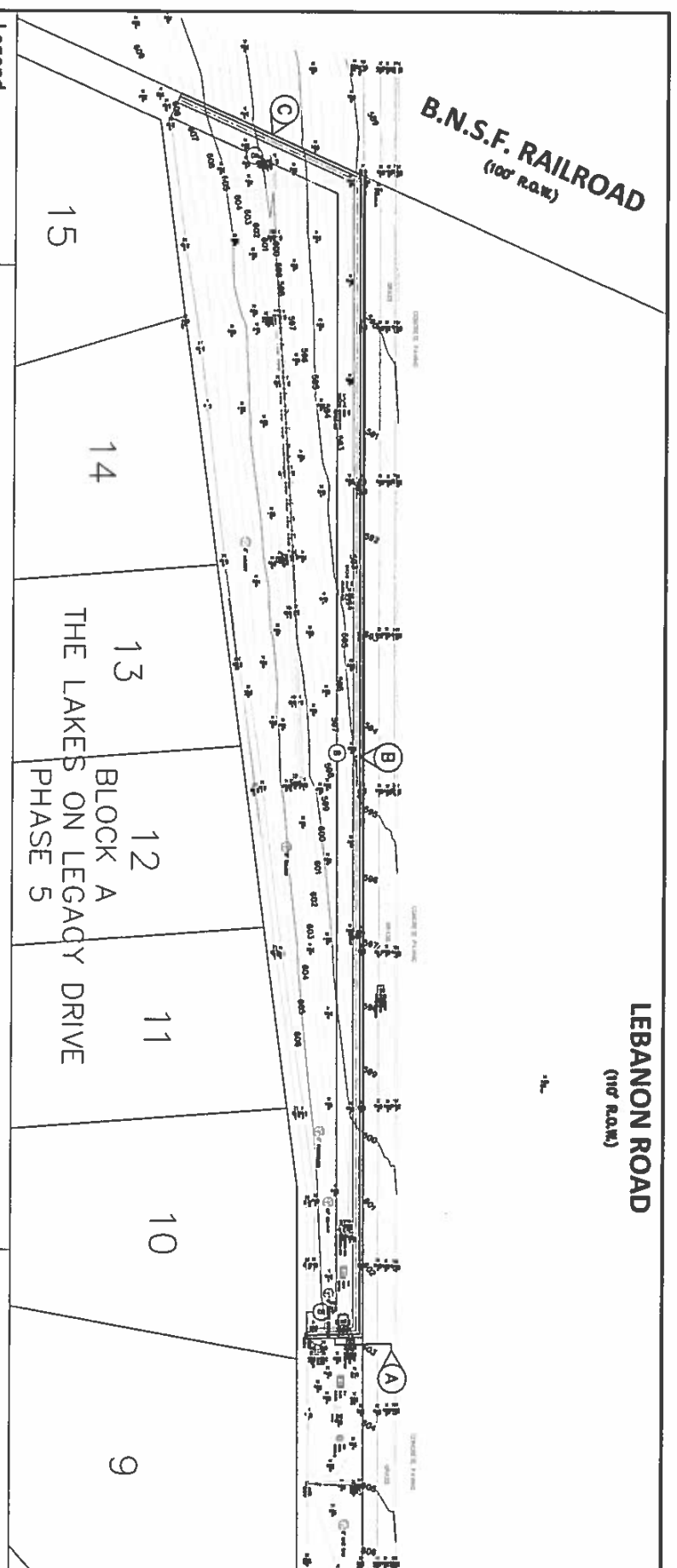


Masonry screen wall mow strip at top of review slope circa November 3, 2010. 'Floating' mow strip between pier supported pilasters showing significant rotation and translation with reduction in support from slope below.

Retaining wall near mid-length of reviewed slope circa November 3, 2010. Significant downward movement is readily apparent.



Retaining wall near mid-length of reviewed slope circa November 3, 2010. Soil surface has dropped approximately 8" vertically and migrated multiple inches laterally from the base of the retaining wall at the top of the slope.



15

14

13

12

11

10

9

THE LAKES ON LEGACY DRIVE

BLOCK A

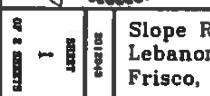
PHASE 5

Plan view partially recreated and modified from Dunaway Associates topographic survey dated 07/25/2012 to show approximate existing site geometry and concept slope remediation and retaining wall locations only.

No other use is intended and none should be inferred.

This drawing is for concept review only. Not for construction.

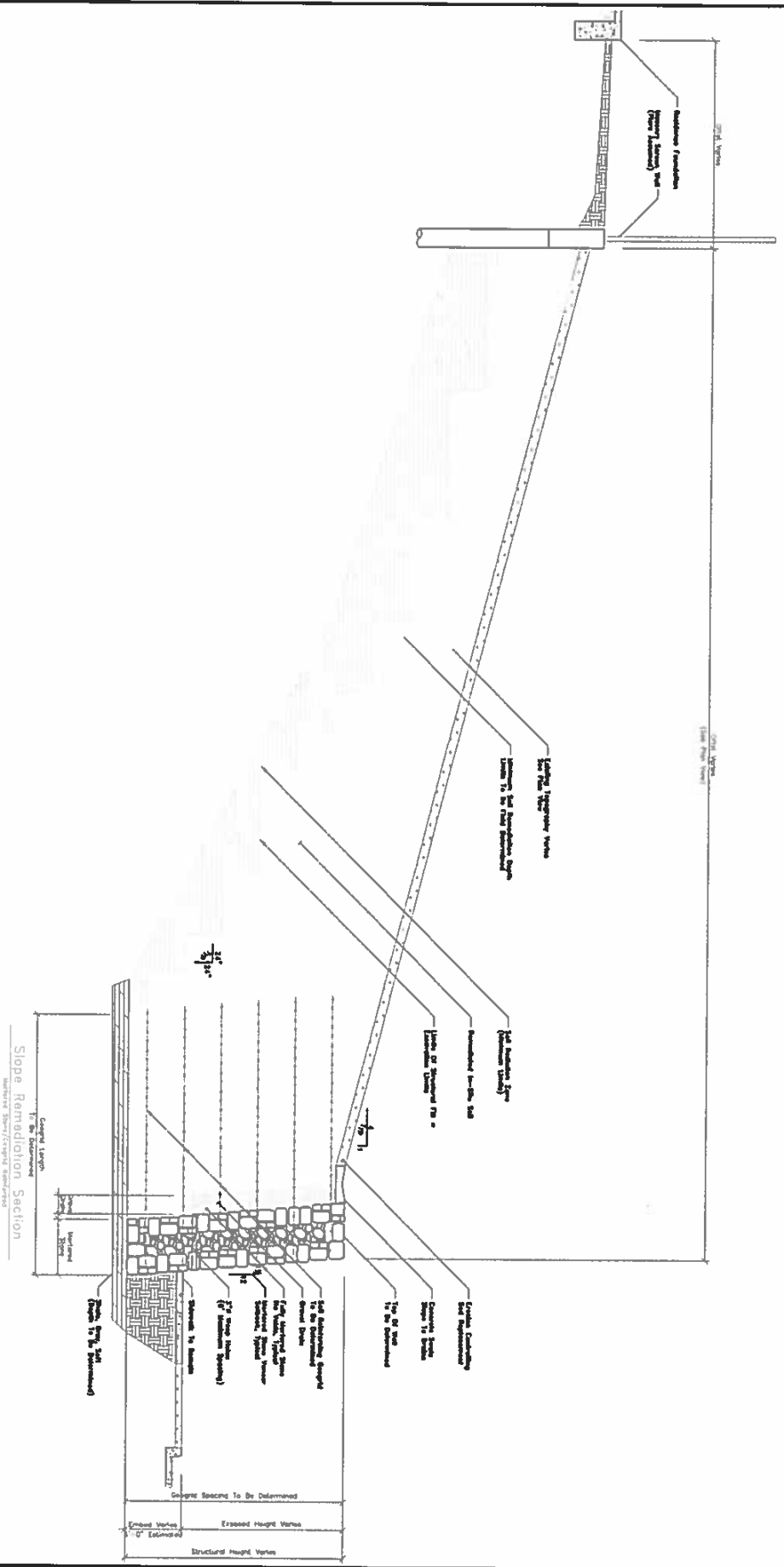
The seal appearing on this document was authorized by Glenn Tracy, P.E. on October 08, 2012.



Slope Remediation
Lebanon Rd @ BNRR (SEQ)
Frisco, TX

Design	Date	By	Revision	Date	By
Design	10/07	GT			
Drawn	10/07	GT			
Check	10/07	GT			

GLENN TRACY, P.E.
 Consulting Engineer
 Form # 1-000078
 P.O. Box 164561
 Irving, TX 75016-0561
 (972) 254-6873 (office)
 glenn.tracy@verizon.net



Slope Remediation Section
 Section Through Retention Wall
 Section Through Retention Wall

This drawing is for concept review only. Not for construction.

The seal appearing on this document was authorized by Glenn Tracy, P.E. on October 08, 2012.



SHEET 2 OF 3 SHEETS	Slope Remediation - Typical Section Lebanon Rd @ BNRR (SEQ) Frisco, TX					
	GLENN TRACY, P.E. Consulting Engineer Firm # 1-000078 P.O. Box 104561 Irving, TX 75010-0561 (972) 254-4873 (office) glenn.tracy@verizon.net					
		Date	By	Revision	Date	By
	Design	10/07	GT			
Drawn	10/07	GT				
Check	10/07	GT				

**GEOTECHNICAL ENGINEERING STUDY
SLOPE REMEDIATION
SEC LEBANON ROAD AT BNSF RAIL
CROSSING
FRISCO, TEXAS**

Presented To:

**City of Frisco
Engineering Services Department**

August 2012

PROJECT NO. 1738-12-01

August 9, 2012
Report No 1738-12-01

City of Frisco – Engineering Services Department
6101 Frisco Square Blvd.
3rd Floor
Frisco, Texas 75034

Attn: Mr. Paul Knippel, P.E., Director of Engineering Services

**RE: GEOTECHNICAL ENGINEERING STUDY
SLOPE REMEDIATION
SEC LEBANON ROAD AT BNSF RAIL CROSSING
FRISCO, TEXAS**


Dear Mr. Knippel:

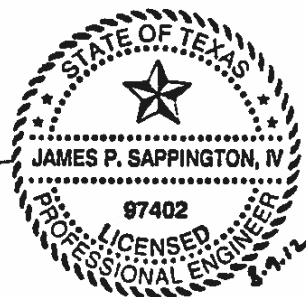
Submitted here are the results of a geotechnical engineering study for the referenced project. This study was performed in general accordance with Estimate No. 12-3855 (Revised) dated June 21, 2012. Formal authorization to initiate the geotechnical services was provided via City of Frisco Purchase Order #01205362 dated June 29, 2012.

Engineering analyses and recommendations are contained in the text section of the report. Results of our field and laboratory services are included in the appendix of the report. We would appreciate the opportunity to be considered for providing geotechnical engineering services for any future projects.

We appreciate the opportunity to be of service to the City of Frisco and its consultants. Please contact us if you have any questions or if we may be of further service at this time.

Respectfully submitted,
CMJ ENGINEERING, INC.
TEXAS FIRM REGISTRATION NO. F-9177


James P. Sappington, IV, P.E.
Project Engineer
Texas No. 97402



copies submitted: (3) Mr. Paul Knippel, P.E., City of Frisco (mail and email)
(1) Mr. Glenn Tracy, P.E., Consulting Engineer (email).

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APPENDIX A

	<u>Plate</u>
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	<u>Plate</u>
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1.0 INTRODUCTION

1.1 Project Description

This report presents the results of a geotechnical engineering study of slope stability at the southeast quadrant of Lebanon Road at the BNSF rail crossing in Frisco, Texas. Plate A.1 depicts the project vicinity and location of the exploration boring.

The BNSF rail crossing is a grade separated crossing, with Lebanon Road crossing beneath an elevated railway. The cut slope on the south side of the road was constructed at an approximate 2.5H:1V slope with an overall height on the order of 20 feet. A tiered concrete bag retaining wall system is present mid-slope in the southeast quadrant, with evidence of previous skin sliding.

Surveying of the failed area was provided by Dunaway Associates, LP of Fort Worth, Texas. Results and recommendations for remediation were coordinated with Mr. Glenn Tracy, P.E., Consulting Engineer, Irving, Texas.

1.2 Purpose and Scope

The purpose of this geotechnical engineering study has been to determine the general subsurface conditions, evaluate the engineering characteristics of the subsurface materials encountered, analyze slope conditions, and provide recommendations and geotechnical design parameters for remedial measures to be designed by Mr. Glenn Tracy, P.E., Consulting Engineer.

To accomplish its intended purposes, the study has been conducted in the following phases: (1) drilling a sample boring to determine the general subsurface conditions and to obtain samples for testing; (2) performing laboratory tests on appropriate samples to determine pertinent engineering properties of the subsurface materials; and (3) performing engineering analyses, using the field and laboratory data, to develop geotechnical recommendations for the proposed construction.

The design is currently in progress and the locations and/or elevations of the structure could change. The recommendations contained in this report are based on data supplied by the City of Frisco, Mr. Glenn Tracy, P.E., Consulting Engineer, and Dunaway Associates, LP. Once the final design is near completion (80-percent to 90-percent stage), it is recommended that CMJ Engineering, Inc. be retained to review those portions of the construction documents pertaining to

the geotechnical recommendations, as a means to determine that our recommendations have been interpreted as intended.

1.3 Report Format

The text of the report is contained in Sections 1 through 7. All plates and large tables are contained in Appendix A. The alpha-numeric plate and table numbers identify the appendix in which they appear. Small tables of less than one page in length may appear in the body of the text and are numbered according to the section in which they occur.

Units used in the report are based on the English system and may include tons per square foot (tsf), kips (1 kip = 1,000 pounds), kips per square foot (ksf), pounds per square foot (psf), pounds per cubic foot (pcf), and pounds per square inch (psi).

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Subsurface materials at each project site were explored by one exploration boring as shown on the Plan of Boring, Plate A.1. Boring B-1 was drilled to a depth of 41 feet using continuous and intermittent sampling and hollow stem auger methods at the approximate location shown on the Plan of Boring, Plate A.1. The boring log is included on Plate A.4 and keys to classifications and symbols used on the log are provided on Plates A.2 and A.3. Estimated top of ground elevation at the boring location was interpreted from topographic information provided by Dunaway Associates, LP.

Undisturbed samples of cohesive soils were obtained with nominal 3-inch diameter thin-walled (Shelby) tube samplers at the locations shown on the log of boring. The Shelby tube sampler consists of a thin-walled steel tube with a sharp cutting edge connected to a head equipped with a ball valve threaded for rod connection. The tube is pushed into the soil by the hydraulic pulldown of the drilling rig. The soil specimens were extruded from the tube in the field, logged, tested for consistency with a hand penetrometer, sealed, and packaged to limit loss of moisture.

The consistency of cohesive soil samples was evaluated in the field using a calibrated hand penetrometer. In this test a 0.25-inch diameter piston is pushed into the relatively undisturbed sample at a constant rate to a depth of 0.25 inch. The results of these tests, in tsf, are tabulated at

respective sample depths on the log. When the capacity of the penetrometer is exceeded, the value is tabulated as 4.5+.

To evaluate the relative density and consistency of the harder formations, a modified version of the Texas Cone Penetration test was performed at selected locations. Texas Department of Transportation (TxDOT) Test Method Tex-132-E specifies driving a 3-inch diameter cone with a 170-pound hammer freely falling 24 inches. This results in 340 foot-pounds of energy for each blow. This method was modified by utilizing a 140-pound hammer freely falling 30 inches. This results in 350 foot-pounds of energy for each hammer blow. In relatively soft materials, the penetrometer cone is driven 1 foot and the number of blows required for each 6-inch penetration is tabulated at respective test depths, as blows per 6 inches on the log. In hard materials (rock or rock-like), the penetrometer cone is driven with the resulting penetrations, in inches, recorded for the first and second 50 blows, a total of 100 blows. The penetration for the total 100 blows is recorded at the respective testing depths on the boring log.

Continuous coring was performed at selected intervals in rock and rock-like materials using an NW (formerly NX) size, double-tube core barrel. This core barrel produces a nominal 2-inch diameter core sample. The core recovery and Rock Quality Designation (RQD) in percent are included in the appropriate column on the log of boring. The recovered percent is presented first for each core run and the RQD percent is presented immediately aside the recovered percent.

2.2 Laboratory Testing

Laboratory soil tests were performed on selected representative samples recovered from the boring. In addition to the classification tests (liquid limits and plastic limits), moisture content, unit weight, and unconfined compressive strength tests were performed. Results of the laboratory classification tests, moisture content, unit weight, and unconfined compressive strength tests conducted for this project are included on the boring log.

Consolidated undrained triaxial shear tests were performed within the overburden soils. The shear tests were performed in order to obtain strength parameters of the soils and to help identify strength parameters. The results of the triaxial shear tests are presented on Plates A.5 and A.6.

The above laboratory tests were performed in general accordance with applicable ASTM procedures, or generally accepted practice.

3.0 SURFACE AND SUBSURFACE CONDITIONS

3.1 Site Geology

The Dallas Sheet of the Geologic Atlas of Texas indicates the project site is located in the Eagle Ford Formation of the Upper Cretaceous age. The Eagle Ford Formation is composed primarily of dark shales with an occasional very thin sandstone or limestone stratum. Calcareous concretions, roughly spherical and up to 18 inches in diameter are found throughout this formation. The Eagle Ford weathers to tan or tan and gray shaly clay with a dark brown to black residual soil, both of which are highly active.

3.2 Site Reconnaissance

The slope appears to be regularly irrigated and is vegetated with mowed Bermuda grasses and occasional small caliper trees near the top of slope. A masonry screen wall/fence is present immediately at the top of the slope and a concrete bag retaining wall is present mid-slope. Several slope slippage planes were noted at various locations: near the top of the wall (base of the masonry screen wall), in the area encompassing the existing concrete bag retaining wall at mid-slope, and also slope slide debris overtopping the concrete sidewalk present at the toe. The base of the retaining wall exhibits distress in several locations, likely as a result of loss of ground support. The slope slide planes had a semi-circular arc (looking horizontal) that affected only the localized portion of the slope around each failed area. One, but not all of the trees present near the top of the slope exhibits severe leaning downslope. Several of the other trees were slightly bowed downslope, indicating an ongoing and long-term movement/creep. An isolated location of water seepage with algae growth was noted atop the sidewalk at the toe.

The various slope slides appear to be shallow skin slides. No evidence of deep-seated sliding was noted. Even though the side slope is steeper than normally acceptable slopes (i.e., steeper than 3H to 1V), the slope does not show abnormal or adverse stability problems or conditions other than the slope slippage noted above. No evidence of massive global slope instability was noted.

3.3 Soil and Rock Conditions

Specific types and depths of subsurface strata encountered at the boring location are shown on the boring log in Appendix A. The generalized subsurface stratigraphy encountered in the boring is discussed below. Note that depths on the boring refer to the depth from the existing grade or

ground surface present at the time of the investigation, and the boundaries between the various soil types are approximate.

Boring B-1 was advanced on the uphill side at the top of the slope. Soils encountered consist of dark brown, light brown, and brown clays with gravel overlying light brown and gray shaly clays with iron seams. The shaly clays exhibit slickensided characteristics. Soil properties of the various clays had tested Liquid Limit (LL) values varying from 58 to 65, Plasticity Index (PI) values varying from 35 to 45, and pocket penetrometer readings varying from 2.75 to greater than 4.5 tsf. The various clay soils classify as CH according to the Unified Soil Classification System (USCS).

Tested unit dry weight values vary from 90 to 108 pcf and unconfined compressive strength values vary from 3,360 to 8,610 psf. Selected strength tests resulted in premature failures due to blocky or slickensided planes. Triaxial shear tests provided tested values of effective cohesion varying from 262 to 712 psf and angle of internal friction values of 9.7 to 39.9 degrees. For total shear strength parameters, cohesion varies from 224 to 622 psf while angle of internal friction values varied from 9.1 to 28.6 degrees. The positive influence of gravel present within the upper clay soils is noted with respect to tested internal friction angle values. Strength testing generally indicate moderate to good strength test values.

Gray shale was encountered in Boring B-1 at a depth of 23 feet (corresponding to approximate Elevation 586) and continued to boring termination depth at 41 feet. The shale is soft (sedimentary rock basis), with Texas Cone Penetrometer (THD) test values ranging from 40 blows per foot of penetration to 4 inches of penetration for 100 hammer blows. Unconfined compressive strength values in the shale varied from 10,562 to 21,590 psf.

3.4 Ground-Water Observations

The boring was drilled using hollow stem augers in order to observe ground-water seepage during drilling. Ground-water seepage was not encountered in Boring B-1 above a depth of 25 feet. Below 25 feet, wet rotary drilling methods were employed.

Fluctuations of the ground-water level can occur due to seasonal variations in the amount of rainfall; site topography and runoff; hydraulic conductivity of soil strata; and other factors not evident at the time the boring was performed. The possibility of ground-water level fluctuations should be considered when developing the design and construction plans for the project. The

possibility exists that perched water may occur within joints in the clays or via more permeable strata, particularly after periods of heavy or extended rainfall.

4.0 SLOPE STABILITY ANALYSES

4.1 Slope Stability Analysis – Deep Seated Failure Plane

CMJ Engineering, Inc. selected GSTABL7 with STEDwin to perform the slope stability analyses for this project. GSTABL7 with STEDwin is a combination of GSTABL7, an off shoot based on the original PCSTABL6-1986 developed at Purdue University. It is a two-dimensional, limit equilibrium slope stability program developed and enhanced by Garry H. Gregory, P.E. and Harold W. VanAller, P.E. CMJ Engineering, Inc. utilized GSTABL7, Version 2.

This slope stability analysis utilizes Modified Bishop and Simplified Janbu methodology for analysis. Circular, random, and sliding block search routines are available for analysis. Analysis also allows the utilization of anisotropic soil strength parameters which aid in modeling tension cracks of bedding planes as well as different soil strength in different directions. The system overall allows analyses of hundreds of search options and potential failure surfaces and results in a print out showing the geometry, soil parameter summary, and listing of the ten most critical failure surfaces analyzed, focusing and highlighting the most critical surface with the lowest safety factor.

Numerous analyses were conducted by CMJ Engineering, Inc. to identify the worst-case methodology to use in analysis as well as the appropriate soil parameters, which affect the slope stability. Slope stability analyses were checked using circular and wedge failure conditions. Slope stability analyses were conducted based on geometrics provided by Dunaway Associates, LP. Plates B.1 through B.3 depict the geometry derived from topographic information. The assumed soil properties utilized for analysis are denoted in the table in the upper left on Plates B.1 through B.3. The soil type below each profile line is denoted with a number that corresponds to the table in the upper left. The table lists the assumed unit weight and strength properties for each soil type.

Three soil zones are selected to represent in-situ materials and consist of the following:

- Soil 1 – Upper clay soil zone with gravel, exhibiting relatively low cohesive strength and moderate internal angle of friction; selected to have a cohesion of 200 psf and a friction angle of 28 degrees
- Soil 2 – Shaly clay with moderate cohesive strength over Soil 1; selected to have a cohesion of 600 psf and a friction angle of 9 degrees

- Soil 3 – Shale, possessing significant strength parameters, selected to have a cohesion of 5,000 psf and a friction angle of 20 degrees

Additional slope stability analyses were performed assuming all clay soils were completely saturated (i.e., soils have internal angle of friction of 0 degrees; therefore, an ultra-conservative analysis) in order to analyze worst-case conditions and most amenable to development of a deep-seated type failure.

The following summarizes deep-seated slope stability results:

TABLE 1. SLOPE STABILITY ANALYSES SUMMARY

Plate No.	Clay Strength		Shaly Clay Strength		Failure Plane	Factor of Safety
	Cohesion (psf)	Friction Angle, Φ	Cohesion (psf)	Friction Angle, Φ		
B.1	200	28	600	9	Circular	2.27
B.2	200	0	600	0	Circular	1.62
B.3	200	0	600	0	Wedge	1.51

Analyses with a $\Phi = 0$ option is considered conservative. Even small values of angle of internal friction increases resultant factors of safety significantly. A $\Phi = 0$ degree analysis assumes a saturated slope condition for clay soils.

Readers should understand that a factor of safety of 1.0 implies impending failure and a factor of safety of less than 1.0 implies the slope would fail based on the input parameters. Common practices in the geotechnical industry requires that a long-term safety factor on the order of 1.5 or greater be established for the safety of a slope. This essentially means that the resisting forces to sliding will be 50 percent greater that the driving forces for long-term conditions.

The results for deep-seated slope stabilization indicate that this failure mechanism has satisfactory factors of safety. Even ultra-conservative parameters shown on Plates B.2 and B.3 reflect factors of safety above failure.

4.2 Slope Stability Analysis - Shallow Skin Slide

Analyses of shallow skin slides are not conducive to computer aided methodologies. Hand solutions using an infinite slope were employed (Lambe and Whitman). The goal was to assess what value of soil cohesion, assuming an angle of internal friction equals 0 degrees, would cause

failure (i.e., factor of safety equal 1). Assuming an infinite 2.5 horizontal to 1 vertical slope with a 4-foot thickness, a soil cohesion on the order of 200 psf would cause instability. This analysis does not account for desiccation cracks which, when filled with water, adds to the instability of a slope.

The results of this analysis indicate that surficial soil moisture must have been higher than tested values, resulting in strength parameters softer than tested values to reach failure of this slope. The typical failure mechanism for a similar shallow slide is water infiltration through desiccation cracks resulting in weakened surficial soils and development of seepage parallel to the slope face. Otherwise, a soft soil zone could have been placed along the actual slide plane or poor earthwork practices (no benching of fill/natural soils) may have occurred when the slope was constructed. Regardless, surface slippage/creep problems should be expected for an earthen slope with a height of 20 feet and a slope on the order of 2.5H:1V within the Eagle Ford geology.

4.3 Slope Stability Results Comments

The results of slope stability analyses indicate that deep-seated instability is not a concern. Furthermore, a factor of safety equal 1 condition would require near-surface soils to moisten/lose strength compared to tested values.

Based on field observations and the above analyses, it is our opinion that the slope failure is series of skin slides and slope creep, combining a combination of a block failure with slight rotation. Remediation should concentrate on the near-surface soil refurbishing. It is our opinion that radical reconstruction of the entire slope is not entirely necessary, assuming refurbishing of the shallow soils of concern does not cause deeper soil failures.

4.4 Remediation Recommendations

The primary objective in slope remediation is to prevent future skin sliding in the area of the existing slope slippage. Several options or combinations thereof exist to remediate the slope as follows:

- Option 1 – Remove existing soil in the failure zone and replace this soil with select fill, thereby providing a soil fill with greater strength,
- Option 2 – Remove existing soil in the failure zone; use the same soil as backfill and “reinforce” the clay soil with geogrid for the full width/length of the affected area, with GeoGrid placed every 2 feet of elevation,

- Option 3 – Reduce the current slope angle to an acceptable slope (4H:1V or flatter) via the use of a properly designed retaining wall at the toe,
- Option 4 – Reinforcing the slope vertically with flat plate reinforcing. This method consists of driving vertically a series of steel posts with flat plates that act as small “braces” which provide horizontal passive pressure to resist further soil movement.

Option 1 is most conventional. It replaces the soft, disturbed soil with a sandy clay/clayey sand select fill (Liquid Limit less than 35 and Plasticity Index between 4 and 16). The disturbed soil should be removed to the failure plane plus 5 feet. New select fill should be placed in 8-inch loose lifts, stair-stepped into competent, undisturbed natural soils with height, and compacted to at least 95 percent Standard Proctor Density, at a moisture content between -2 and +3 percentage points of optimum.

Option 2 requires removing disturbed existing soil, plus 5 feet, in a similar nature as above. This soil is stockpiled for future re-use. A geogrid (Tensar TriAx TX160 or equivalent) is placed every 2 feet of fill height to add reinforcing strength to the existing skin slide soils. The clay soils should be pulverized and placed/compacted per Option 1 above.

Option 3 employs installing a suitable retaining wall system at the slope toe and re-working the existing soils to a slope on the order of 4H:1V or flatter.

Option 4 employs vertical flat plate reinforcing within the existing failed slope. This technology is marketed by Slope Reinforcement Technology (Danville, California [email: contact@sloperepair.com]). This option requires a larger shovel-type machine, capable of hammering the flat plate through the existing fill and into the natural soils, thereby resting atop rock. As long as natural soils do not possess rock fragments, this method may be successful. It is important that the plate device penetrate undisturbed soils below the slide plane. This methodology should be reviewed by the above company for feasibility, design, and installation.

In all the above options, removal of the existing concrete bag wall is recommended. In addition, careful consideration should be given to the locations of replacement irrigation systems such that the system will not serve as a source or conduit to introduce subsurface water into the slope which would cause weakening of surficial slope soils

4.5 Ancillary Comments

The wall at the base of the slope would be required for Option 3. Should a wall be constructed, preferably, it should be one which will gain passive pressure resistance by embedment of structural units into hard shaly clays and/or the underlying shale materials. The following table provides at-rest and active pressure recommendations, assuming the unstable slope is reworked per Option 3.

Recommended lateral earth pressures expressed as equivalent fluid pressures, per foot of wall height, are presented in Table 2 for a wall with a 4H:1V sloped backfill behind the top of the wall. The equivalent fluid pressure for an undrained condition should be used if a drainage system is not present to remove water trapped in the backfill and behind the wall. Pressures are provided for at-rest and active earth pressure conditions. In order to allow for an active condition, the top of the wall(s) must deflect on the order of 0.4 percent.

For the select fill or free draining granular backfill, these values assume that a "full" wedge of the material is present behind the wall. The wedge is defined where the wall backfill limits extend outward at least 2 feet from the base of the wall and then upward on a 1H:2V slope. For narrower backfill widths of granular or select fill soils, the equivalent fluid pressures for the on-site soils should be used.

TABLE 2				
Equivalent Fluid Pressures for Sloped Backfill at 4H:1V				
Backfill Material	At-Rest Equivalent Fluid Pressure (pcf)		Active Equivalent Fluid Pressure (pcf)	
	Drained	Undrained	Drained	Undrained
Excavated on-site clay or clay fill material	125	135	105	120
Select fill or on-site soils meeting material specifications	90	125	70	105
Free draining granular backfill material	75	115	55	100

After a minimum 3-foot embedment into hard shaly clays/soft shale, a passive pressure of 250 pounds per square foot, per foot depth may be used in design.

Wall backfill material requirements are as follows:

Granular Wall Backfill: All free draining granular wall backfill material should be a crushed stone, sand/gravel mixture, or sand/crushed stone mixture. The material should have less than 3 percent passing the No. 200 sieve and less than 30 percent passing the No. 40 sieve. The minus No. 40

sieve material should be non-plastic. Granular wall backfill should not be water jetted during installation.

Select Fill Behind Walls: All wall select backfill should consist of clayey sand and/or sandy clay material with a plasticity index of 16 or less, with a liquid limit not exceeding 35. The select fill should be placed in maximum 8-inch lifts and compacted to between 95 and 100 percent of Standard Proctor density (ASTM D 698) within a moisture range of plus 3 to a minus 2 percentage points of the optimum moisture. Compaction within five feet of the walls should be accomplished using hand compaction equipment and should be compacted between 90 and 95 percent of the Standard Proctor Density.

On-Site Soil Backfill: For wall backfill areas with site-excavated materials or similar imported materials, all oversized fragments larger than four inches in maximum dimension should be removed from the backfill materials prior to placement. The backfill should be free of all organic and deleterious materials, and should be placed in maximum 8-inch compacted lifts at a minimum of 95 percent of Standard Proctor density (ASTM D 698) within a moisture range of plus 3 to minus 2 percentage points of optimum moisture. Compaction within five feet of the walls should be accomplished using hand compaction equipment, and should be between 90 and 95 percent of the Standard Proctor Density.

5.0 EARTHWORK

5.1 Site Preparation

The subgrade should be firm and able to support the construction equipment without displacement. Soft or yielding subgrade should be corrected and made stable before construction proceeds. The subgrade should be proof rolled to detect soft spots, which if exist, should be reworked to provide a firm and otherwise suitable subgrade. Proof rolling should be performed using a heavy pneumatic tired roller, loaded dump truck, or similar piece of equipment. The proof rolling operations should be observed by the project geotechnical engineer or his/her representative. Prior to fill placement, the subgrade should be scarified to a minimum depth of 8 inches, its moisture content adjusted, and recompacted to the moisture and density recommended for fill.

5.2 Placement and Compaction

Any new fill should be stair stepped into the existing fill on horizontal planes with each stair step being on the order of 1 to 2 feet vertical. This prevents a continuous potential slope slide plane. All fill materials should be placed in accordance with the following section of this report.

Fill material should be placed in loose lifts not exceeding 8 inches in uncompacted thickness. The uncompacted lift thickness should be reduced to 4 inches for structure backfill zones requiring hand-operated power compactors or small self-propelled compactors. The fill material should be uniform with respect to material type and moisture content. Clods and chunks of material should be broken down and the fill material mixed by disking, blading, or plowing, as necessary, so that a material of uniform moisture and density is obtained for each lift. Water required for sprinkling to bring the fill material to the proper moisture content should be applied evenly through each layer.

The fill material should be compacted to a minimum of 95 percent of the maximum dry density determined by the Standard Proctor test, ASTM D 698. In conjunction with the compacting operation, the fill material should be brought to the proper moisture content. The moisture content for general earth fill should range from 2 percentage points below optimum to 5 percentage points above optimum (-2 to +5). These ranges of moisture contents are given as maximum recommended ranges. For some soils and under some conditions, the contractor may have to maintain a more narrow range of moisture content (within the recommended range) in order to consistently achieve the recommended density.

Field density tests should be taken as each lift of fill material is placed. As a guide, one field density test per lift for each 5,000 square feet of compacted area is recommended. For small areas or critical areas the frequency of testing may need to be increased to one test per 2,500 square feet. A minimum of 2 tests per lift should be required. The earthwork operations should be observed and tested on a continuing basis by an experienced geotechnician working in conjunction with the project geotechnical engineer.

Each lift should be compacted, tested, and approved before another lift is added. The purpose of the field density tests is to provide some indication that uniform and adequate compaction is being obtained. The actual quality of the fill, as compacted, should be the responsibility of the contractor and satisfactory results from the tests should not be considered as a guarantee of the quality of the contractor's filling operations.

5.3 Excavation

The side slopes of excavations through the overburden soils should be made in such a manner to provide for their stability during construction. Existing structures, pipelines or other facilities, which

are constructed prior to or during the currently proposed construction and which require excavation, should be protected from loss of end bearing or lateral support.

Temporary construction slopes and/or permanent embankment slopes should be protected from surface runoff water. Site grading should be designed to allow drainage at planned areas where erosion protection is provided, instead of allowing surface water to flow down unprotected slopes.

Trench safety recommendations are beyond the scope of this report. The contractor must comply with all applicable safety regulations concerning trench safety and excavations including, but not limited to, OSHA regulations.

5.4 Erosion and Sediment Control

All disturbed areas should be protected from erosion and sedimentation during construction, and all permanent slopes and other areas subject to erosion or sedimentation should be provided with permanent erosion and sediment control facilities. All applicable ordinances and codes regarding erosion and sediment control should be followed.

6.0 CONSTRUCTION OBSERVATIONS

In any geotechnical investigation, the design recommendations are based on a limited amount of information about the subsurface conditions. In the analysis, the geotechnical engineer must assume the subsurface conditions are similar to the conditions encountered in the boring. However, quite often during construction anomalies in the subsurface conditions are revealed. Therefore, it is recommended that CMJ Engineering, Inc. be retained to observe earthwork and perform materials evaluation during the construction phase of the project. This enables the geotechnical engineer to stay abreast of the project and to be readily available to evaluate unanticipated conditions, to conduct additional tests if required and, when necessary, to recommend alternative solutions to unanticipated conditions. Until these construction phase services are performed by the project geotechnical engineer, the recommendations contained in this report on such items as final foundation bearing elevations, proper soil moisture condition, and other such subsurface related recommendations should be considered as preliminary.

It is proposed that construction phase observation and materials testing commence by the project geotechnical engineer at the outset of the project. Experience has shown that the most suitable method for procuring these services is for the owner or the owner's design engineers to contract

directly with the project geotechnical engineer. This results in a clear, direct line of communication between the owner and the owner's design engineers and the geotechnical engineer.

7.0 REPORT CLOSURE

The boring for this study was selected by CMJ Engineering, Inc. The location and elevation of the boring should be considered accurate only to the degree implied by the methods used in their determination. The boring log shown in this report contains information related to the types of soil encountered at specific locations and times and show lines delineating the interface between these materials. The log also contains our field representative's interpretation of conditions that are believed to exist in those depth intervals between the actual samples taken. Therefore, the boring log contains both factual and interpretive information. Laboratory soil classification tests were also performed on samples from selected depths in the boring. The results of these tests, along with visual-manual procedures were used to generally classify each stratum. Therefore, it should be understood that the classification data on the log of boring represents visual estimates of classifications for those portions of each stratum on which the full range of laboratory soil classification tests were not performed. It is not implied that the log is representative of subsurface conditions at other locations and times.

With regard to ground-water conditions, this report presents data on ground-water levels as they were observed during the course of the field work. In particular, water level readings have been made in the boring at the times and under conditions stated in the text of the report and on the boring log. It should be noted that fluctuations in the level of the ground-water table can occur with passage of time due to variations in rainfall, temperature and other factors. Also, this report does not include quantitative information on rates of flow of ground water into excavations, on pumping capacities necessary to dewater the excavations, or on methods of dewatering excavations. Unanticipated soil conditions at a construction site are commonly encountered and cannot be fully predicted by mere soil samples, test borings or test pits. Such unexpected conditions frequently require that additional expenditures be made by the owner to attain a properly designed and constructed project. Therefore, provision for some contingency fund is recommended to accommodate such potential extra cost.

The analyses, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our field investigation and further on the assumption that the exploratory boring is representative of the subsurface conditions throughout the site; that is, the

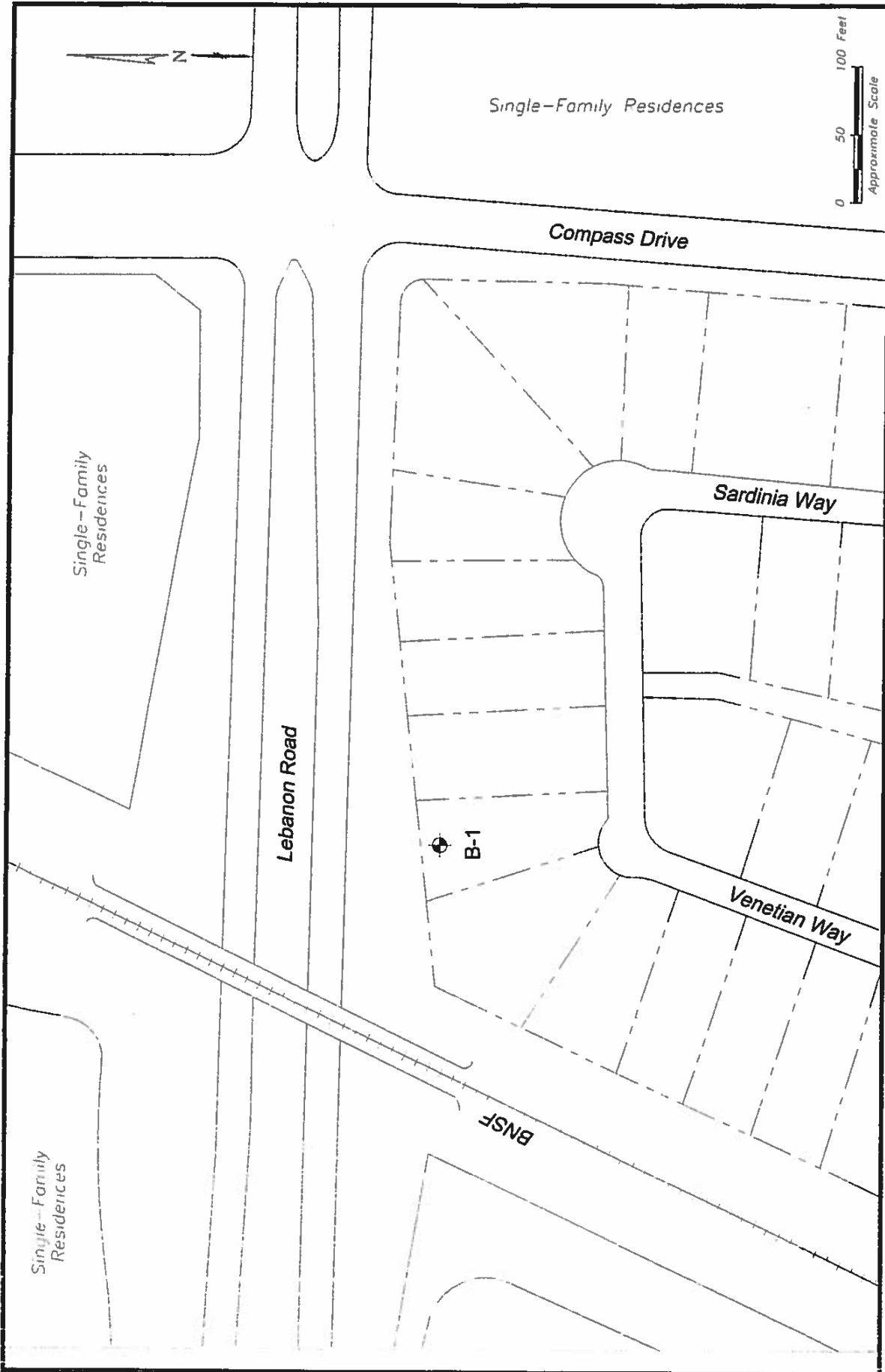
subsurface conditions everywhere are not significantly different from those disclosed by the boring at the time it was completed. If, during construction, different subsurface conditions from those encountered in our boring are observed, or appear to be present in excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between submission of this report and the start of the work at the site, if conditions have changed due either to natural causes or to construction operations at or adjacent to the site, or if structure locations, structural loads or finish grades are changed, we urge that we be promptly informed and retained to review our report to determine the applicability of the conclusions and recommendations, considering the changed conditions and/or time lapse.

Further, it is urged that CMJ Engineering, Inc. be retained to review those portions of the plans and specifications for this particular project that pertain to earthwork and foundations as a means to determine whether the plans and specifications are consistent with the recommendations contained in this report. In addition, we are available to observe construction, particularly the compaction of structural fill, or backfill and the construction of foundations as recommended in the report, and such other field observations as might be necessary.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, ground water or air, on or below or around the site.

This report has been prepared for use in developing an overall design concept. Paragraphs, statements, test results, boring logs, diagrams, etc. should not be taken out of context, nor utilized without a knowledge and awareness of their intent within the overall concept of this report. The reproduction of this report, or any part thereof, supplied to persons other than the owner, should indicate that this study was made for design purposes only and that verification of the subsurface conditions for purposes of determining difficulty of excavation, trafficability, etc. are responsibilities of the contractor.

This report has been prepared for the exclusive use of the City of Frisco and its consultants for specific application to design of this project. The only warranty made by us in connection with the services provided is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.



CMJ PROJECT No. 1738-12-01

PLAN OF BORING

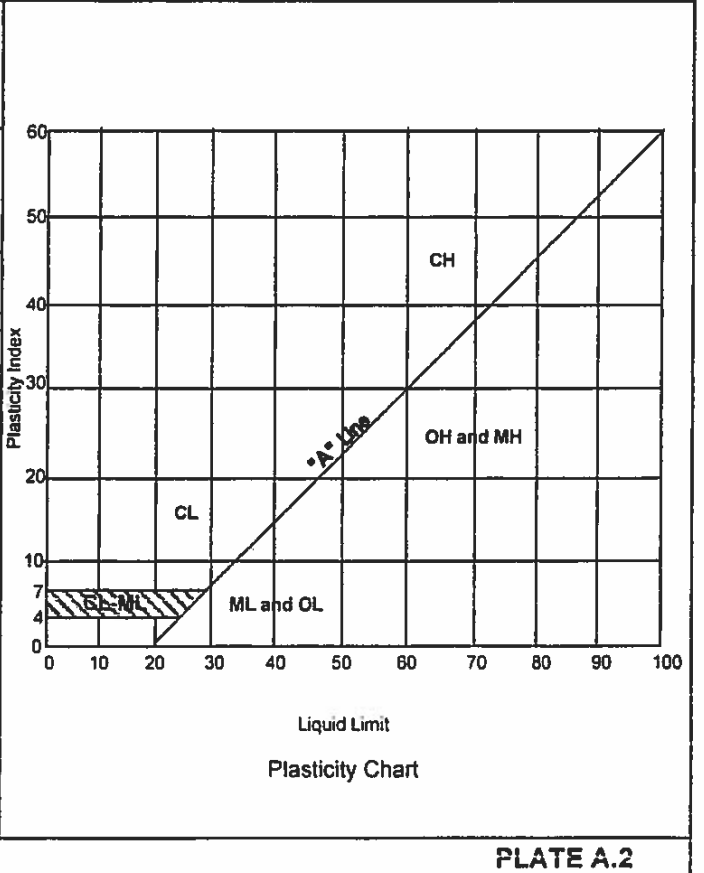
**SLOPE REMEDIATION
 SEC LEBANON ROAD AT BNSF RAIL CROSSING
 FRISCO, TEXAS**

**PLATE
 A.1**

Major Divisions		Grp Sym.	Typical Names	Laboratory Classification Criteria				
Coarse-grained soils (more than half of the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for GW			
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines				
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures		Liquid and Plastic limits below "A" line or P.I. greater than 4	Liquid and plastic limits plotting in hatched zone between 4 and 7 are borderline cases requiring use of dual symbols	
			GC	Clayey gravels, gravel-sand-clay mixtures		Liquid and Plastic limits above "A" line with P.I. greater than 7		
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for SW			
			SP	Poorly graded sands; gravelly sands, little or no fines				
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures		Liquid and Plastic limits below "A" line or P.I. less than 4	Liquid and plastic limits plotting between 4 and 7 are borderline cases requiring use of dual symbols	
			SC	Clayey sands, sand-clay mixtures		Liquid and Plastic limits above "A" line with P.I. greater than 7		

Determine percentages of sand and gravel from grain size curve.
 Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:
 Less than 5 percent.....GW, GP, SW, SP
 More than 12 percent.....GM, GC, SM, SC
 5 to 12 percent.....Borderline cases requiring dual symbols

Fine-grained soils (More than half of material is smaller than No. 200 sieve)		Grp Sym.	Typical Names
Silt and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays	
	OL	Organic silts and organic silty clays of low plasticity	
	Silt and clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
Highly Organic soils	Pt	Peat and other highly organic soils	



SOIL OR ROCK TYPES

	GRAVEL		LEAN CLAY		LIMESTONE						
	SAND		SANDY		SHALE						
	SILT		SILTY		SANDSTONE						
	CLAYEY		HIGHLY PLASTIC CLAY		CONGLOMERATE						

TERMS DESCRIBING CONSISTENCY, CONDITION, AND STRUCTURE OF SOIL

Fine Grained Soils (More than 50% Passing No. 200 Sieve)

Descriptive Item	Penetrometer Reading, (tsf)
Soft	0.0 to 1.0
Firm	1.0 to 1.5
Stiff	1.5 to 3.0
Very Stiff	3.0 to 4.5
Hard	4.5+

Coarse Grained Soils (More than 50% Retained on No. 200 Sieve)

Penetration Resistance (blows/foot)	Descriptive Item	Relative Density
0 to 4	Very Loose	0 to 20%
4 to 10	Loose	20 to 40%
10 to 30	Medium Dense	40 to 70%
30 to 50	Dense	70 to 90%
Over 50	Very Dense	90 to 100%

Soil Structure

Calcareous	Contains appreciable deposits of calcium carbonate; generally nodular
Slickensided	Having inclined planes of weakness that are slick and glossy in appearance
Laminated	Composed of thin layers of varying color or texture
Fissured	Containing cracks, sometimes filled with fine sand or silt
Interbedded	Composed of alternate layers of different soil types, usually in approximately equal proportions

TERMS DESCRIBING PHYSICAL PROPERTIES OF ROCK

Hardness and Degree of Cementation

Very Soft or Plastic	Can be remolded in hand; corresponds in consistency up to very stiff in soils
Soft	Can be scratched with fingernail
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail
Hard	Difficult to scratch with knife
Very Hard	Cannot be scratched with knife
Poorly Cemented or Friable	Easily crumbled
Cemented	Bound together by chemically precipitated material; Quartz, calcite, dolomite, siderite, and iron oxide are common cementing materials and iron oxide are common cementing materials

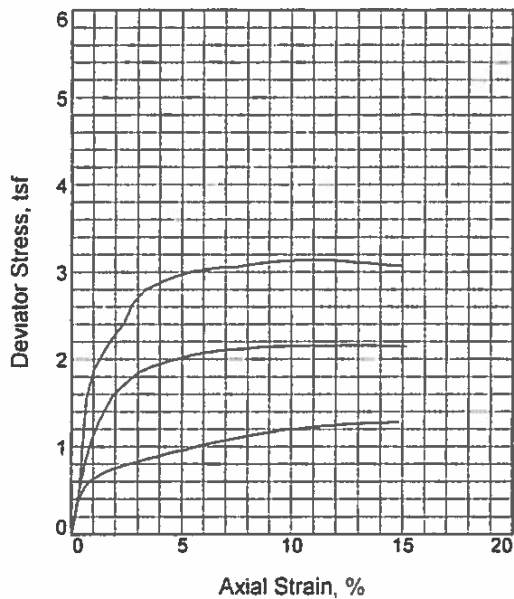
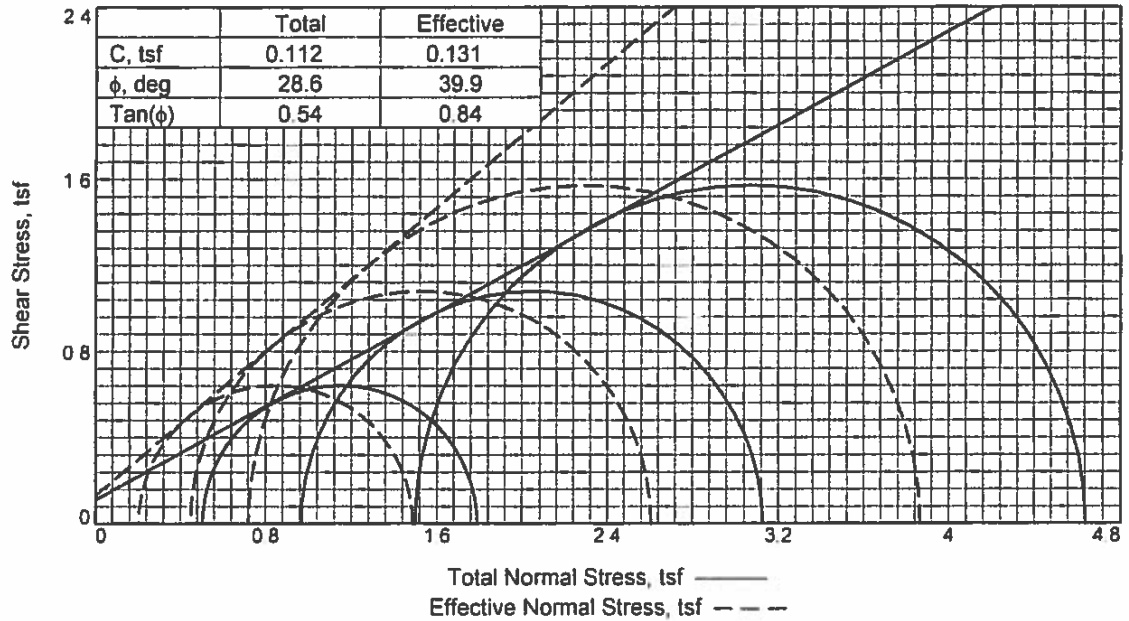
Degree of Weathering

Unweathered	Rock in its natural state before being exposed to atmospheric agents
Slightly Weathered	Noted predominantly by color change with no disintegrated zones
Weathered	Complete color change with zones of slightly decomposed rock
Extremely Weathered	Complete color change with consistency, texture, and general appearance approaching soil

Project No 1738-12-01	Boring No B-1	Project Slope Remediation - SEC Lebanon Road at BNSF Rail Crossing Frisco, Texas
Location See Plate A.1		Water Observations Dry during drilling; wet rotary coring below 25'
Completion Depth 41.0'	Completion Date 6-27-12	

Depth, Ft.	Symbol Samples	Surface Elevation	Type	REC %	ROD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
		609.0	HSA										
		607.0	CLAY , dark brown, w/ calcareous nodules and gravel, very stiff			4 25					21	108	5390
			CLAY , light brown and brown, w/ gravel, very stiff			3 5		58	23	35	28	90	
5		603.0	SHALY CLAY , light brown and gray, slickensided, stiff to very stiff -w/ iron seams below 7'			4.0		65	20	45	25		
						3 25					25	103	3360
						2 75					25		
		592.0	SHALY CLAY , gray, w/ iron seams, slickensided, hard			3 25		65	24	41	29	94	
						4 5+		65	23	42	24	103	8610
		586.0	SHALE , gray, soft			4 5+					16	119	21590
				56	37	78/12"					19	114	11168
				81	81	40/12"					18	113	10562
				100	100	100/6 5"					18	113	16272
		568.0				100/4"							

LOG OF BORING 1738-12-01 GPJ CMJ GDT 6/8/12



Sample No.	1	2	3	
Initial	Water Content, %	28.3	27.2	28.7
	Dry Density, pcf	89.8	93.5	89.8
	Saturation, %	88.0	92.1	89.2
	Void Ratio	0.8626	0.7900	0.8636
	Diameter, in	1.45	1.45	1.45
	Height, in	3.10	3.30	2.95
At Test	Water Content, %	32.2	29.5	32.2
	Dry Density, pcf	89.8	93.5	89.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8626	0.7900	0.8636
	Diameter, in	1.45	1.45	1.45
	Height, in	3.10	3.30	2.95
Strain rate, in./min	0.03	0.03	0.03	
Back Pressure, psi	10.00	10.00	10.00	
Cell Pressure, psi	17.00	23.40	30.80	
Fail Stress, tsf	1.28	2.16	3.14	
Total Pore Pr., tsf	1.02	1.24	1.50	
Ult Stress, tsf				
Total Pore Pr., tsf				
$\bar{\sigma}_1$ Failure, tsf	1.49	2.61	3.86	
$\bar{\sigma}_3$ Failure, tsf	0.20	0.45	0.72	

Type of Test:

CU with Pore Pressures

Sample Type: Undisturbed

Description: Clay, dark brown

LL= 58 PL= 23 PI= 35

Assumed Specific Gravity= 2.68

Remarks:

Client:

Project:

Sample Number: B-1 Depth: 2.0'-6.0'

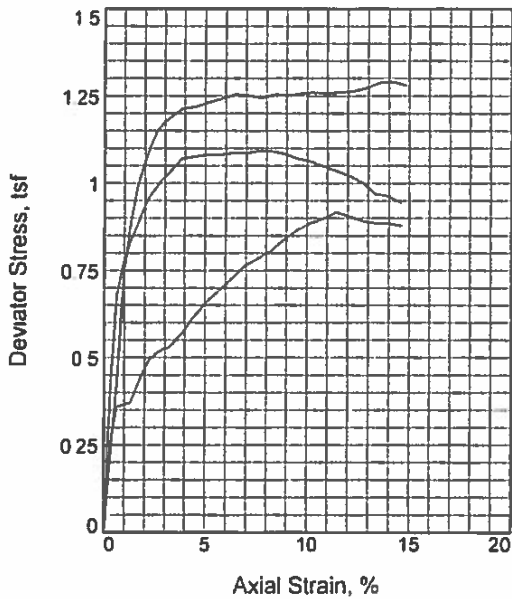
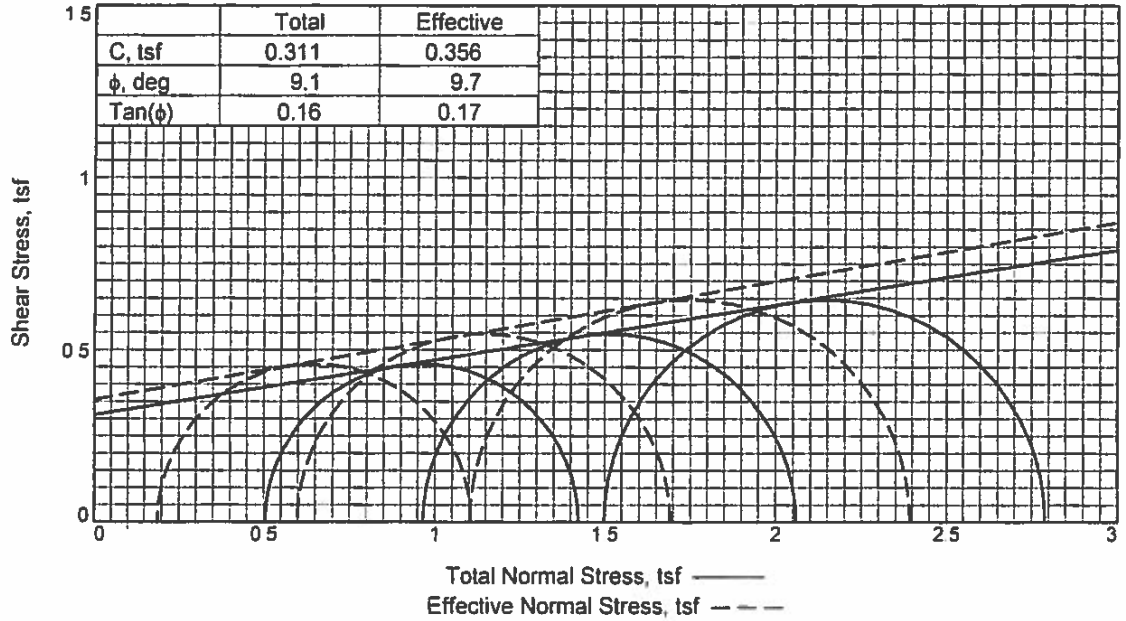
Proj. No.: 1738-12-01

Date Sampled: 7/2/2012

TRIAXIAL SHEAR TEST REPORT

M L Testing, LLC
Bluff Dale, TX

PLATE A.5



Sample No		1	2	3
Initial	Water Content, %	28.5	27.9	26.7
	Dry Density, pcf	94.2	94.9	96.9
	Saturation, %	98.2	97.9	98.6
	Void Ratio	0.7764	0.7627	0.7267
	Diameter, in.	1.45	1.45	1.45
	Height, in.	3.15	3.15	3.10
At Test	Water Content, %	29.0	28.5	27.1
	Dry Density, pcf	94.2	94.9	96.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7764	0.7627	0.7267
	Diameter, in.	1.45	1.45	1.45
	Height, in.	3.15	3.15	3.10
Strain rate, in /min	0.03	0.03	0.03	
Back Pressure, psi	10.00	10.00	10.00	
Cell Pressure, psi	17.00	23.40	30.80	
Fail. Stress, tsf	0.92	1.09	1.29	
Total Pore Pr., tsf	1.04	1.09	1.12	
Ult Stress, tsf				
Total Pore Pr., tsf				
$\bar{\sigma}_1$ Failure, tsf	1.10	1.69	2.39	
$\bar{\sigma}_3$ Failure, tsf	0.19	0.60	1.10	

Type of Test:

CU with Pore Pressures

Sample Type: Undisturbed

Description: Clay, olive-gray

LL= 65 PL= 24 PI= 41

Assumed Specific Gravity= 2.68

Remarks:

Client:

Project:

Sample Number: B-1

Depth: 13.0'-15.0'

Proj. No.: 1738-12-01

Date Sampled: 7/2/2012

TRIAXIAL SHEAR TEST REPORT

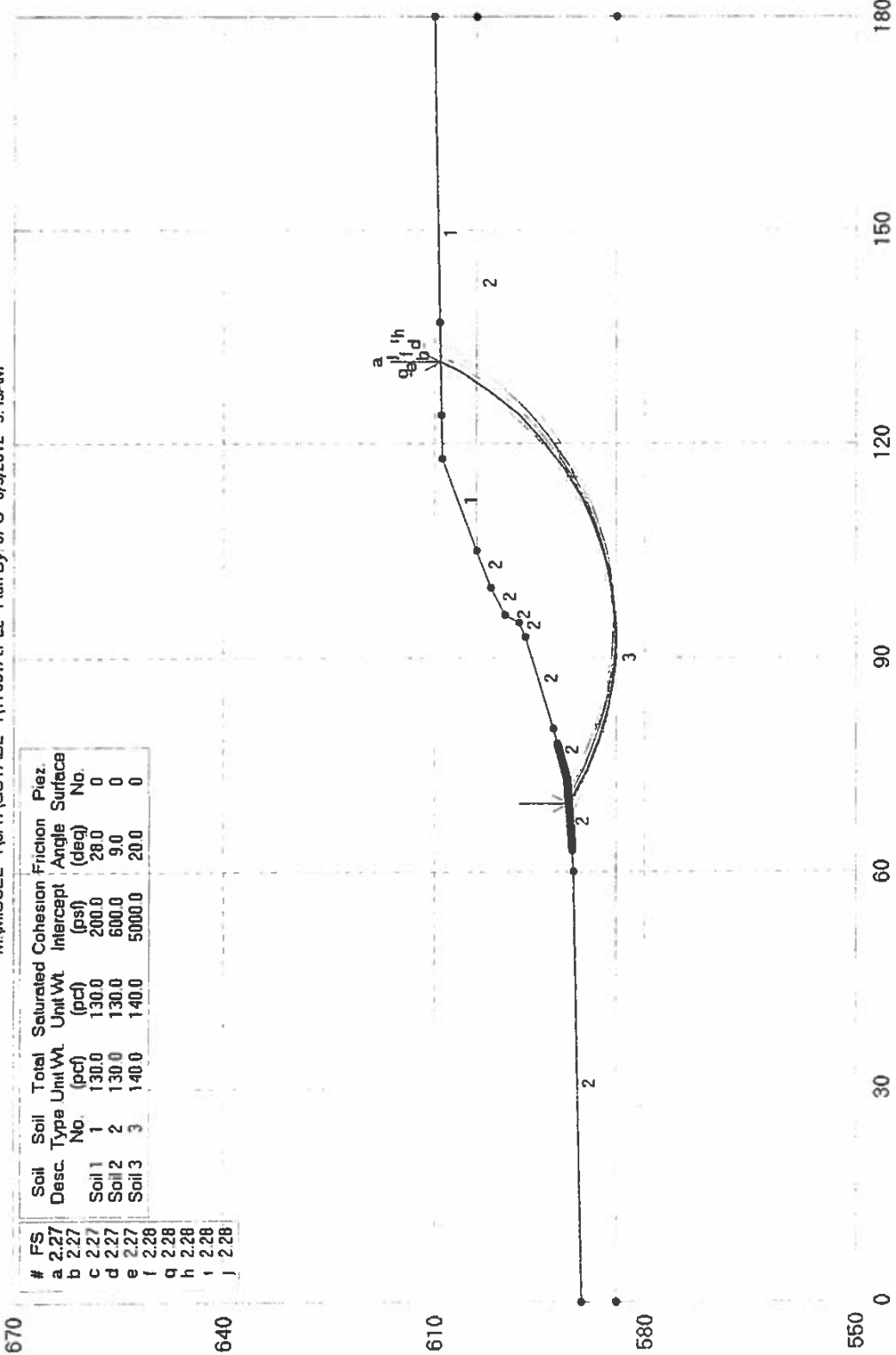
M L Testing, LLC

Bluff Dale, TX

PLATE A.6

Slope Remediation - SEC Lebanon Rd. at BNSF Crossing - Frisco, Texas

M:\MISCELL\117381A\PL2 Run By JPS 8/9/2012 9:45AM



# FS	Soil Desc.	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a 2.27	Soil 1	130.0	130.0	200.0	28.0	0
b 2.27	Soil 2	130.0	130.0	600.0	9.0	0
c 2.27	Soil 3	140.0	140.0	5000.0	20.0	0

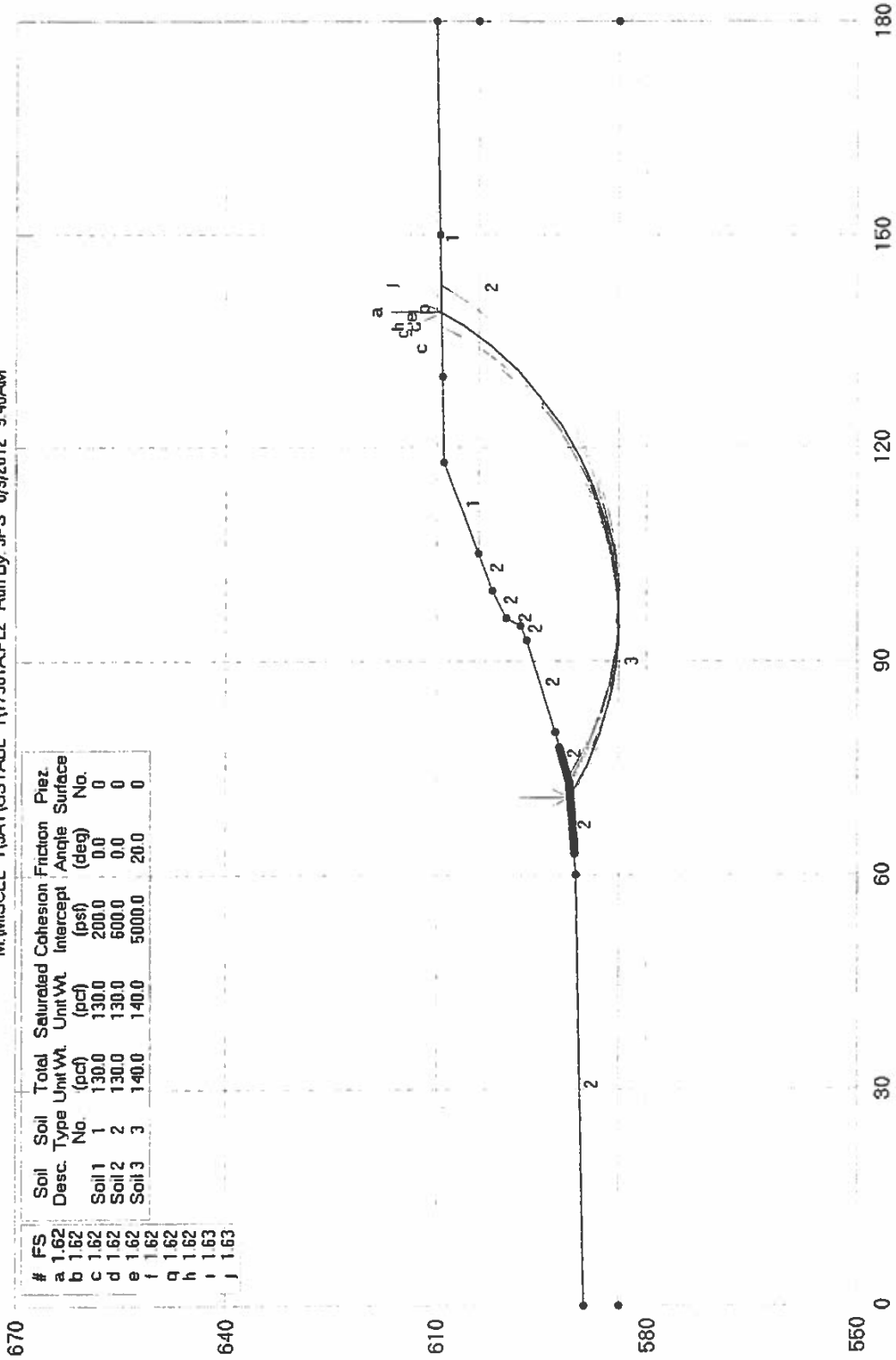
GSTABL7 v.2 FSmin=2.27

Safety Factors Are Calculated By The Modified Bishop Method



Slope Remediation - SEC Lebanon Rd. at BNSF Crossing - Frisco, Texas

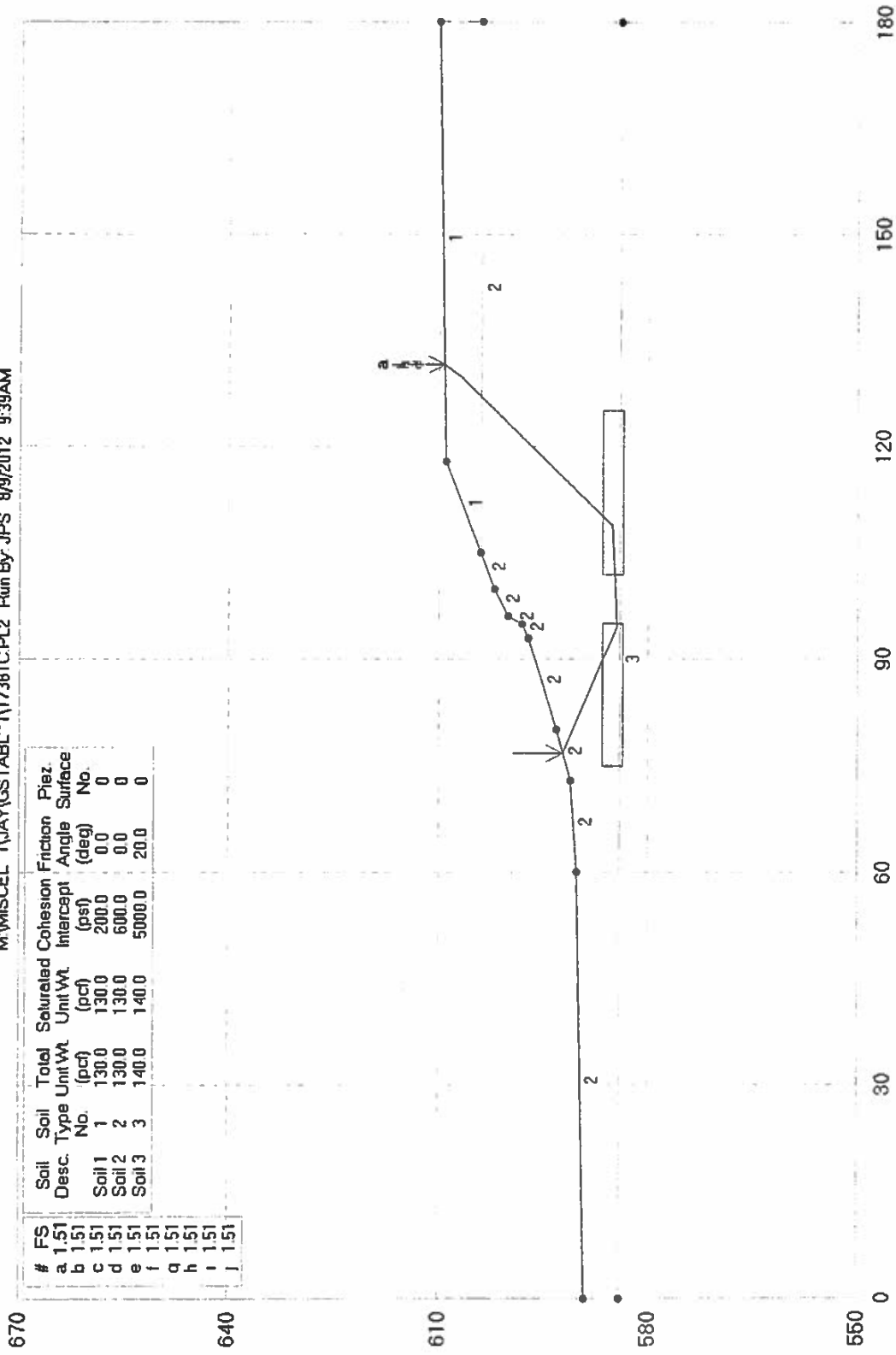
M:\MISC\11\JAY\GSTABL~1\17381A\PL2 Run By: JFS 8/9/2012 9:40AM



GSTABL7 v.2 FSmin=1.62
Safety Factors Are Calculated By The Modified Bishop Method



Slope Remediation - SEC Lebanon Rd. at BNSF Crossing - Frisco, Texas
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#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psi)	Friction Angle (deg)	Piez. Surface No.
a	1.51	Soil 1	1	130.0	130.0	200.0	0.0	0
b	1.51	Soil 2	2	130.0	130.0	600.0	0.0	0
c	1.51	Soil 3	3	140.0	140.0	5000.0	20.0	0

GSTABL7 v.2 FSmin=1.51
 Safety Factors Are Calculated By The Simplified Janbu Method





GEOTECHNICAL INVESTIGATION

FRISCO EVENTS CENTER ROADWAYS FRISCO, TEXAS

AGG REPORT NO. E14-0503

JUNE 19, 2014

PREPARED FOR:

KIMLEY-HORN AND ASSOCIATES, INC.

PRESENTED BY:



Geotechnical Engineering – Environmental Consulting – Construction Materials Engineering Testing
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- GEOTECHNICAL ENGINEERING
- ENVIRONMENTAL CONSULTING
- CONSTRUCTION MATERIALS ENGINEERING

June 19, 2014

Mr. Joe Riccardi, P.E.
Kimley-Horn and Associates, Inc.
12750 Merit Drive, Suite 1000
Dallas, Texas 75251

Phone: (972) 770-1300
Email: joe.riccardi@kimley-horn.com

Re: Geotechnical Investigation
Frisco Events Center Roadways
Frisco, Texas
AGG Report No. E14-0503

Dear Mr. Riccardi:

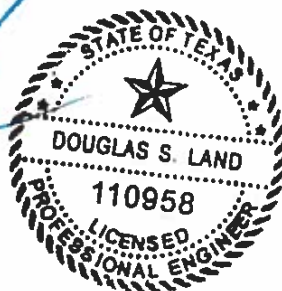
Please find enclosed our report summarizing the results of the geotechnical investigation performed at the above referenced project. We trust the recommendations derived from this investigation will provide you with the information necessary to complete your proposed project successfully.

For your construction materials testing and related quality control requirements, it is recommended that the work be performed by Alliance Geotechnical Group in order to maintain continuity of inspection and testing services for the project under the direction of the geotechnical engineer.

We thank you for the opportunity to provide you with our professional services. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,
ALLIANCE GEOTECHNICAL GROUP
Texas Registered Engineering Firm F-1970


Douglas S. Land, P.E.
Frisco Office Manager



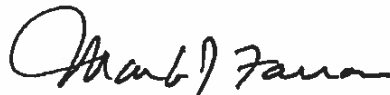

Mark J. Farrow, P.E.
Senior Vice President



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**GEOTECHNICAL INVESTIGATION
FRISCO EVENTS CENTER ROADWAYS
FRISCO, TEXAS**

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The project consists of the design and construction of various roadways associated with the new Multi-Use Events Center and surrounding development located at the northwest corner of Dallas North Tollway (DNT) and Warren Parkway. Based on information provided by Kimley-Horn, the project will consist of the following roadways:

- John Hickman Parkway – Starting at DNT, and extending approximately 2,000 feet west. Type B thoroughfare; four-lane divided roadway
- Gaylord Parkway – Starting at Warren Parkway and extending approximately 3,500 feet north to meet with John Hickman Parkway; Type B thoroughfare; four-lane divided roadway
- Internet Boulevard – Starting at Warren Parkway and extending approximately 800 feet north. Type C thoroughfare; two-lane roadway with side parking on each side of the road.
- Cowboys Parkway – Approximately 2,200 linear feet of new roadway. Type C thoroughfare; two-lane highway with side parking on one side of the road
- Gridiron Road – Approximately 1,000 linear feet of new roadway. Type C thoroughfare; two-lane highway
- Varsity Drive – Approximately 1,300 linear feet of new roadway. Type C thoroughfare; two-lane highway

Grading plans for the proposed roadways were provided by Kimley Horn. Anticipated cuts and fills to achieve final pavement grades at each boring location are indicated on the boring logs.

1.2 PURPOSE AND SCOPE

The purposes of this geotechnical investigation were to: 1) explore the subsurface conditions at the site, 2) provide boring logs that present subsurface conditions encountered including water level observations and laboratory test results, 3) provide subgrade preparation recommendations in general accordance with Section 3 of the City of Frisco Engineering Standards (Subgrade Design Requirements) 4) provide recommendations for the pavement sub-base layer and 5) provide pavement thickness recommendations. This

3.0 LABORATORY TESTING

Laboratory tests were performed on representative samples of the soil to aid in classification of the soil materials. These tests included Atterberg limits tests, percent finer than the #200 sieve, moisture content tests and dry unit weight determinations. Hand penetrometer tests were performed on the soil samples to provide indications of the swell potential and the bearing properties of the subsurface strata. The results of these tests are presented on the Logs of Borings (Figures 2 through 42).

To provide additional information about the swell characteristics of these soils (at their in-situ moisture conditions), absorption swell tests were performed on selected samples of the clay soils (see Figure 44 and 45). Per the City's Subgrade Design requirements, the swell tests were performed under a surcharge load of 200 psf. Soluble sulfate tests and pH/lime series, tests were also performed, as required by the City Standards. (see Figures 46 through 48)

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 GENERAL SITE CONDITIONS

The project consists of the design and construction of various new roadways as part of the new Frisco Events Center located at the northwest corner of the Dallas North Tollway (DNT), and Warren Parkway. The site is generally open land with site vegetation consisting of mowed grass and various north/south, and east/west tree lines. See Boring Location Plans (Figures 1A and 1B) for site location and configuration.

4.2 SITE GEOLOGY

As shown on the Dallas sheet of the Geologic Atlas of Texas, the site is underlain by the Austin Chalk Limestone Formation approximately 2,500 feet east of the contact with the softer Eagle Ford Shale Formation. The Austin Chalk Formation consists of limestone with interbedded layers of shale and clay. Soils derived from this formation are typically plastic clays exhibiting a moderate to high shrink/swell potential with variations in moisture content.

4.3 SUBSURFACE CONDITIONS

Subsurface conditions encountered in the borings, including descriptions of the various strata, their depths, and thicknesses, are presented on the Logs of Borings. Note that depth on all borings refers to the depth from the existing grade or ground surface present at the time of the investigation. Boundaries between the various soil types are approximate.

4.4 GROUNDWATER CONDITIONS

The borings were advanced using continuous flight auger methods. Advancement of the borings using these methods allows observation of the initial zones of seepage. Groundwater was encountered at the end of drilling in Boring B-1 at a depth of 9 feet below existing grade. Groundwater was not encountered within the other test borings during drilling and the borings were dry upon completion. All borings were backfilled with soil cuttings at the end of the day.

It is not possible to accurately predict the magnitude of subsurface water fluctuations that might occur based upon short-term observations. The subsurface water conditions are subject to change with variations in climatic conditions and are functions of subsurface soil conditions, rainfall and water levels within nearby creeks and ponds.

5.0 ANALYSIS AND SUBGRADE RECOMMENDATIONS

5.1 SOIL MOVEMENTS

The subsurface exploration revealed the presence of active clay soils over severely weathered and weathered limestone with calcareous clay layers. The surficial clay soils have a high shrink/swell potential in their current average to dry condition. The deeper severely weathered and weathered limestone with clay layers have a moderate to low shrink/swell potential.

Potential Vertical Rise (PVR) calculations were performed using moisture contents, penetrometer readings, and swell test results to estimate the swell potential of the soil. PVR values have been estimated for soil swell based on proposed final grades (based on current grading plans) and based on the current average to dry soil conditions. Based on our analysis, the potential soil swell movements vary along the alignments from less than 1 inch to over 8+ inches. The PVR will also be affected by the material used for fill placement and moisture/compaction effort used.

5.2 SUBGRADE MODIFICATION TO REDUCE SOIL MOVEMENTS

As mentioned above, large differential upward pavement movements could occur at this site due to upward soil swelling. Section 3 of the City of Frisco Engineering Standards requires that moisture conditioning be performed beneath roadways where soil swell potential exceeds 2%. Figure 3.1 from the City of Frisco Subgrade Design standards (shown below) was used to derive our recommended depths for moisture conditioning beneath the proposed roadways.

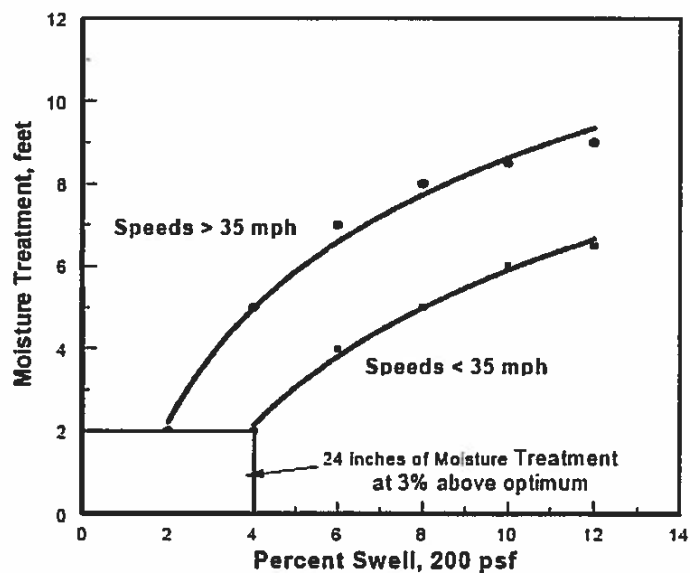


Figure 3.1 From the City of Frisco Subgrade Design Requirements

The above figure was utilized in conjunction with the results of swell testing and final pavement grades to determine the required depths of moisture conditioning beneath the roadways. These depths were determined using the "Swell Testing Alternative" from Section 3 of the City of Frisco Engineering Standards.

TABLE 1 – RECOMMENDED MOISTURE CONDITIONING DEPTHS

Roadway/ Throughfare Class	Borings	Approximate Station Range	Recommended Thickness of Moisture Conditioning
John Hickman/B	B-41 to B-43	4+00 to 12+70	2 ft minimum *
	B-3 to B-5	12+70 to 17+70	6 ft
	B-2	17+70 to 20+20	8 ft
	B-1	20+20 to 23+00	9.5 ft**
Gaylord Parkway/B	B-115 to B-19; B-10 to B-12; B-6, B-7	1+80 to 11+80 19+30 to 24+30; 31+80 to 36+70	2 ft minimum *
	B-8	29+30 to 31+80	5 ft
	B-9	24+30 to 29+30	6 ft
	B-13, B-14	11+80 to 19+30	9.5 ft **
Cowboys Parkway/C	B-25 to B-28	2+00 to 14+00	6.5 ft **
	B-20 to B-24	14+00 to 24+00	2 ft minimum *
Gridiron Road/C	B-29 to B-33	9+50 to 19+80	2 ft minimum *
Varsity Drive/C	B-34, B-35, B-37	2+00 to 7+00; 12+00 to 15+00	2 ft minimum*
	B-36	7+00 to 12+00	5.5 ft
Internet Blvd./C	B-38	1+50 to 2+00	2 ft minimum *
	B-39 & B-40	2+00 to 9+50	6.5 ft **
Roadway Perpendicular to Lebanon/C	B-44 & B-45	2+00 to 6+00	2 ft minimum *

** 2 feet minimum or down to limestone, whichever is shallower.*

*** Maximum required by the City of Frisco per Figure 3.1 shown above.*

Maximum depths for Type B and Type C Thoroughfares are 9.5 feet and 6.5 feet respectively. The City of Frisco may allow for shallower depths of moisture conditioning in these areas. Changes to the maximum required depths shown above should be approved by the City of Frisco.

The depths shown above are based on final proposed pavement grades as provided by Kimley-Horn. Excavation for moisture conditioning should extend to the depths shown above, or until competent limestone is encountered, whichever is shallower. If competent limestone is encountered during excavation prior to achieving the required excavation depths, the excavation may be terminated at the surface of competent limestone. For

transition areas between different depths, we recommend that the transitions be tapered at a 2H:1V slope to dampen abrupt differential movements between these areas.

5.3 FILL PLACEMENT

5.3.1 PROOFROLLING PRIOR TO FILL PLACEMENT

Prior to placing any fill, the exposed subgrade in areas to receive fill should be stripped and proofrolled. Proofrolling should also be performed in cut areas after cutting to final grades. Proofrolling can generally be accomplished using a heavy (25 ton or greater total weight) pneumatic tired roller making several passes over the areas. The proofrolling operations should be performed under the direction of a qualified geotechnical engineer. Where soft or compressible zones are encountered, these areas should be removed to a firm subgrade. Any resulting void areas should be backfilled to finished subgrade in 8 inch compacted lifts as specified below. After completion of proofrolling, the ground surface should then be scarified to a depth of 8 inches and re-compacted as specified below.

5.3.2 MOISTURE CONDITIONING

Per City of Frisco requirements, all moisture treated soil should be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content and compacted to a minimum of 95% of standard Proctor (ASTM D698). Additionally, the moisture treatment shall extend at least 4 feet beyond the edge of pavement. Regardless of the depths shown, any fill placed within 8 feet of the final pavement subgrade should be moisture conditioned per City of Frisco specifications.

Each layer shall be leveled with approved equipment. After spreading, each layer shall be thoroughly manipulated by plowing, discing, or other approved methods of the full depth of the layer being placed to insure uniform density and moisture distribution for proper compaction. The moisture content at the time of compaction should be as specified above. If the material is too dry, it should be moistened by watering before and during manipulation, to properly condition the material for compaction. If the material is too wet, the compaction operation should be delayed until the moisture content has been reduced to within satisfactory compaction range.

Because of time of completion limitations, thoroughly processing of the on-site clay soils will be required during manipulation if the moisture content is below optimum at the time of

placement. Each fill lift should be processed until the soil mixture is free of large clods to allow uniform moisture distribution and uniform compaction within the entire fill lift. This is particularly important if highly plastic clay soils are to be used as fill beneath the roadways. The amount of processing and reworking required to achieve uniform moisture conditions can be reduced by pre-wetting the onsite soils prior to placement.

As a quality control measure, pocket penetrometer (P.P.) tests shall be performed with each field density test during construction as further verification that proper moisture conditioning is being achieved within the clay fill soils. A penetrometer reading between 1.8 tsf and 2.5 tsf will indicate that proper moisture conditioning is being achieved for the clay soils.

5.3.3 DEEP FILL PLACEMENT BELOW ROADWAYS (BELOW 9.5 FEET)

Any fill placed within the upper 9.5 feet should be moisture conditioned in accordance with Section 5.3.2 of this report. We recommend that any deeper fill soils placed below 8 feet be compacted at -1% to +3% of optimum to a minimum of 98% of standard Proctor density (ASTM D698).

5.3.4 ON-SITE BROKEN LIMESTONE FILL

The on-site limestone may be used as fill beneath roadways as an alternative to using moisture conditioned clay soils. Broken limestone should be placed in loose lifts of 8 inches and should be adequately crushed to where individual rock fragments have a diameter of less than 6 inches. The crushed limestone should be compacted at +1% to +4 percentage points above optimum moisture to a minimum of 95% Standard Proctor density (ASTM D 698). The limestone materials should be crushed and compacted using a compactor of sufficient size and weight to crush the rock.

5.4 PAVEMENT SUB-BASE LAYER

5.4.1 TEMPORARY PAVEMENT SURFACE

We understand that temporary roads will be constructed within the roadway alignments to provide fire truck and construction equipment access during construction. The temporary pavement section should consist of 12-inches of flex base meeting the requirements of TxDOT Item 247, Type D, Grade 1. The flex base should be compacted in two (2) six-inch compacted lifts at 95% Modified Proctor density (ASTM D-1557). We recommend that field density tests be performed at a frequency of one test per 300 linear feet. Proof rolling of the

subgrade should be performed per Section 5.3.1 prior to placement of the flex base. If properly placed and compacted, the flex base will adequately support typical fire truck traffic under emergency situations.

5.4.2 PERMANENT PAVEMENT SUB-BASE LAYER

According to Section 3 of the City of Frisco Engineering Standards, 12-inches of lime stabilization is required beneath the pavement surface for soils with swell ranges comparable to swells obtained during this study, and for the thoroughfare classes provided. If the temporary pavement surface is constructed in accordance with Section 5.4.1, the 12-inches of flex base can replace the City standard 12-inches of lime stabilization. We understand the temporary roadways could be in place for up to 2 years prior to the final pavement surface placement. We recommend that the compaction and depth of the flex base be re-tested just prior to paving to verify that the compaction and depth requirements as specified in Section 5.4.1 are met.

5.4.3 STABILIZATION WITH HYDRATED LIME

If flex base is not desired as a permanent pavement sub-base layer, lime stabilization can be performed. The subsurface exploration revealed surficial materials consisting of highly plastic clay soils having a high shrink/swell potential. These clay soils react with hydrated lime, which serves to improve their support value and provide a firm, uniform subgrade beneath the paving. Soluble sulfate tests were performed at various boring locations (Figure 45). Based on the results of the sulfate testing, lime stabilized subgrade is at a low risk of sulfate induced heave.

Based on the results of pH-Lime series tests performed, and the anticipated soil materials to be exposed at pavement subgrade, eight (8) to nine (9) percent hydrated lime by dry weight (82 to 92 pounds per square yard per full 12-inch depth, which is 41 to 46 pounds per square yard for each 6-inch lift) will be required to stabilize the existing clay subgrade. The actual lime requirement will depend upon the actual subgrade soils exposed at final grade and should be determined at the time of construction.

The lime should be thoroughly mixed and blended with the active subgrade soil (TxDOT Item 260) and the mixture compacted to a minimum of 95% of the soils maximum dry density as determined in accordance with ASTM D698, within 0% to +4% of the soil's optimum moisture content (optimum to +4%). We recommend that this lime stabilization

extend a minimum of 4 feet beyond exposed pavement edges, in order to reduce the effects of shrinkage during extended dry periods. After final grading has been achieved, depth checks and PI verification checks should be performed to verify that the specified depth of stabilization is present.

Sand should be specifically prohibited beneath pavement areas during final grading (after stabilization), since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils. After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and re-compacted to obtain a tight non-yielding subgrade.

Project specifications should allow a curing period between initial and final mixing of the lime/soil mixture. After initial mixing, the lime treated subgrade should be lightly rolled and maintained at or within 5 percentage points above the soil's optimum moisture content until final mixing and compaction. We recommend a 3-day curing period for these soils. The following gradation specifications are recommended for the stabilized materials prior to final compaction:

	<u>Percent</u>
Minimum Passing 1" Sieve	100
Minimum Passing 3/4" Sieve	85
Minimum Passing No. 4 Sieve	60

All non-slaking aggregates retained on the No. 4 sieve should be removed prior to testing.

The prepared subgrade should be protected and moist cured or sealed with a bituminous material for a minimum of 7 days or until the pavement materials are placed. Pavement areas should be graded at all times to prevent ponding and infiltration of excessive moisture on or adjacent to the pavement areas.

Due to the presence of expansive clay soils, pavement movements should be anticipated. Inspection during construction is particularly important to verify that proper construction procedures are followed.

5.4.4 MOISTURE MAINTENANCE DURING CONSTRUCTION

We understand that the roadways could remain un-paved for up to 2-years after moisture conditioning. Regardless of the desired sub-base layer, a moisture barrier consisting of 10-mil poly sheeting should be placed horizontally between the moisture conditioned subgrade, and the overlying sub-base layer. The sheeting should extend at least 6 feet on either side of the pavement. Otherwise, if a moisture barrier is not used, we recommend that confirmation moisture-check borings be performed within the roadway alignments just prior to paving, to evaluate if excessive drying has occurred, and/or if additional moisture conditioning will be required.

5.5 PAVEMENT SECTIONS

The City of Frisco Standard pavement design input values are found in Table 3.1 of Section 3 of the Engineering Standards. Table 3.1 is shown below for reference

Table 3.1 From The City of Frisco Engineering Standards

Input	Thoroughfare Classification			
	Type A	Type B	Type C	Types D-G, Alley, Fire Lane
Design Period	20 years	20 years	20 years	20 years
Initial Serviceability	4.5	4.5	4.5	4.5
Terminal Serviceability	2.5	2.3	2.3	2.0
Concrete MOR @ 28 days	620 psi	620 psi	620 psi	620 psi
Concrete E @ 28 days	5,000,000 psi	5,000,000 psi	5,000,000 psi	5,000,000 psi
Modulus of Subgrade Reaction (Eagle Ford Shale Formation)	300 psi/in	300 psi/in	300 psi/in	270 psi/in
Modulus of Sugrade Reaction (Austin Chalk Formation)	420 psi/in	420 psi/in	420 psi/in	420 psi/in
Reliability	95%	92%	90%	85%
Standard Deviation	0.35	0.35	0.35	0.35
Load Transfer Coefficient	2.9	2.9	2.9	2.9
Drainage Coefficient	1.0	1.0	1.0	1.0
Design Average Daily Traffic (ADT)	60,000	30,000	20,000	12,000
Traffic Growth Rate	3%	3%	3%	3%
Percent Trucks	3%	3%	2%	2%
Lanes	6	4	2	2
Lane Distribution Factor	0.7	1	1	1

We understand that the City of Frisco standard pavement sections will be used to determine the concrete pavement section. These standard sections are provided below, taking into account that flex base can be used in lieu of lime stabilized subgrade.

TABLE 2 – FRISCO STANDARD TYPE B THOROUGHFARE PAVEMENT SECTION

JOHN HICKMAN PARKWAY, AND GAYLORD PARKWAY
8.0 inches Portland Cement Concrete
12-0 inches flex base or lime stabilized sub-base (2-6" lifts)
Moisture conditioned subgrade per Table 1

TABLE 3 – FRISCO STANDARD TYPE C THOROUGHFARE PAVEMENT SECTION

COWBOYS PARKWAY, GRIDIRON ROAD, VARSITY DRIVE, INTERNET BLVD, & ROADWAY PERPENDICULAR TO LEBANON
7.0 inches Portland Cement Concrete
12-0 inches flex base or lime stabilized sub-base (2-6" lifts)
Moisture conditioned subgrade per Table 1

AGG performed pavement design calculations to evaluate if the City Standard pavement sections would be adequate for the projected ADT's, growth rates, and truck percentages (fully loaded WB 50 trucks were assumed) shown in Table 3.1. Based on our analysis, the standard sections will be adequate for 0.45% trucks (WB 50) for Type B thoroughfares, and 035% truck for type C thoroughfares (as opposed to the projected 3% shown in Table 3.1). Fully loaded WB 50 trucks were assumed for the pavement analyses. If heavy truck traffic will be utilized by these roadways, AGG should be contacted to review these pavement recommendations. In order to accommodate the projected traffic loads as shown in Table 3.1, we recommend the following pavement sections.

TABLE 4 – RECOMMENDED TYPE B THOROUGHFARE PAVEMENT SECTION

JOHN HICKMAN PARKWAY, AND GAYLORD PARKWAY
11.0 inches Portland Cement Concrete
12-0 inches flex base or lime stabilized sub-base (2-6" lifts)
Moisture conditioned subgrade per Table 1

TABLE 5 – RECOMMENDED TYPE C THOROUGHFARE PAVEMENT SECTION

COWBOYS PARKWAY, GRIDIRON ROAD, VARSITY DRIVE, INTERNET BLVD, & ROADWAY PERPENDICULAR TO LEBANON
9.5 inches Portland Cement Concrete
12-0 inches flex base or lime stabilized sub-base (2-6" lifts)
Moisture conditioned subgrade per Table 1

The above recommended pavement sections were calculated using the input parameters shown in Table 3.1. The concrete should have a minimum 28 day compressive strength of 4,000 psi and a minimum 28 day flexural strength of 620 psi. Concrete quality will be important in order to produce the desired flexural strength and long term durability.

Proper joint placement and design is critical to pavement performance. Load transfer at all joints and maintenance of watertight joints should be provided. Control joints should be sawed as soon as possible after placing concrete and before shrinkage cracks occur. All joints including sawed joints should be properly cleaned and sealed as soon as possible to avoid infiltration of water.

Our previous experience indicates that joint spacing on 12 to 15 foot centers have generally performed satisfactorily. We recommend that the concrete pavement be reinforced with No. 4 bars placed on chairs on approximately 18-inch centers in each direction.

Note: We recommend that the perimeter of the pavements have a stiffening curb section to prevent possible distress due to heavy wheel loads near the edge of the pavements and to provide channelized drainage.

5.6 SITE GRADING AND DRAINAGE

All grading should provide positive drainage away from the proposed roadways and should prevent water from collecting or discharging near the pavements. Water must not be permitted to pond adjacent to or beneath the pavements during or after construction. Otherwise, upward soil swell movements could exceed the estimates contained in this report.

The pavements will be subject to some post construction movement (see Section 5.1 of this report). Joints in the concrete pavements should be sealed to prevent the infiltration of water. Since post construction movement of pavement may occur, joints should be periodically inspected and resealed where necessary.

5.7 PAVEMENT CONSIDERATIONS

It is recommended that provisions be made in the project contract documents to provide for proofrolling in areas where the subgrade will support new pavements. It is also recommended that an item be included for removal and replacement of soft materials, which are identified by this procedure.

Proofrolling can generally be accomplished using a heavy (25 ton or greater total weight) pneumatic tired roller making several passes over the areas. Where soft or compressible zones are encountered, these areas should be removed to a firm subgrade. Wet or very moist surficial materials may need to be undercut and either dried or replaced with proper compaction or replaced with a material which can be properly compacted. Any resulting void areas should be backfilled to finished subgrade in 6 inch compacted lifts compacted to 95 percent of maximum dry density as determined by ASTM D 698 at optimum to +4 percentage points of its optimum moisture content.

Achieving the required field density is dependent upon the adequate pulverization of the clay fill materials, the magnitude of compaction energy and the maintenance of field moisture near optimum. All joints and pavements should be inspected at regular intervals to ensure proper performance and to prevent crack propagation.

The soils at the site are expansive. If positive drainage is not provided, differential pavement movement may occur beneath the moisture conditioned soils depending on the varying depth of the expansive clay along the alignments. The service life of paving may be reduced due to water infiltration into subgrade soils through heave induced cracks in the paving section. This will result in softening and loss of strength of the subgrade soils. It is imperative that all cracks and joints in the pavement be sealed and maintained by routine sealing in order to minimize differential pavement deflections caused by soil swelling

The life of the pavement can be increased with proper drainage. Areas should be graded to prevent ponding adjacent to curbs or pavement edges. Backfill materials, which could hold water behind the curb, should not be permitted. Flat pavement grades should be avoided.

5.8 TREE EFFECTS

It should be recognized that pavements will be subject to long term settlement due to ground shrinkage caused by moisture absorption of tree root systems. To minimize long term settlements, trees should be located no closer to the pavements than 75 percent their ultimate mature tree height to reduce settlement effects caused by moisture absorption of the root systems. If trees must be planted closer than this, a qualified arborist should be consulted regarding root barriers and tree wells to minimize impact to the structures, pavements, and flatwork. Also, it is imperative that the ground beneath the mature unpruned drip lines (and to distances of 10' beyond the drip lines) not be paved. If these areas are paved, mature tree roots will draw moisture from soils underlying the surrounding structures, resulting in settlement to pavements, and flatwork due to soil shrinkage caused by moisture loss. These areas should be landscaped and irrigated. Otherwise, a qualified arborist should be consulted regarding the installation and effectiveness of root barriers installed during construction.

6.0 FIELD SUPERVISION AND CONSTRUCTION TESTING

Field density and moisture content determinations should be made on each lift of fill with a minimum of 1 test per lift per 300 linear feet for the roadway. Supervision by the field technician and the project engineer is required. Some adjustments in the test frequencies may be required based upon the general fill types and soil conditions at the time of fill placement.

Many problems can be avoided or solved in the field if proper inspection and testing services are provided. It is recommended that site preparation, concrete placement, and fill compaction be monitored by a qualified engineering technician. Density tests should be performed to verify compaction and moisture content of any earthwork. Inspection should be performed prior to and during concrete placement operations.

7.0 LIMITATIONS

The professional services, which have been performed, the findings obtained, and the recommendations prepared were accomplished in accordance with currently accepted geotechnical engineering principles and practices. The possibility always exists that the subsurface conditions at the site may vary somewhat from those encountered in the test borings. The number and spacing of test borings were chosen in such a manner as to decrease the possibility of undiscovered abnormalities, while considering the nature of loading, size, and cost of the project. If there are any unusual conditions differing significantly from those described herein, Alliance Geotechnical Group should be notified to review the effects on the performance of the recommended foundation system.

The recommendations given in this report were prepared exclusively for the use of Kimley-Horn, their client, and their consultants. The information supplied herein is applicable only for the design of the previously described development to be constructed at locations indicated at this site and should not be used for any other structures, locations, or for any other purpose.

We will retain the samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the report. After this period, the samples will be discarded unless otherwise notified by the owner in writing.

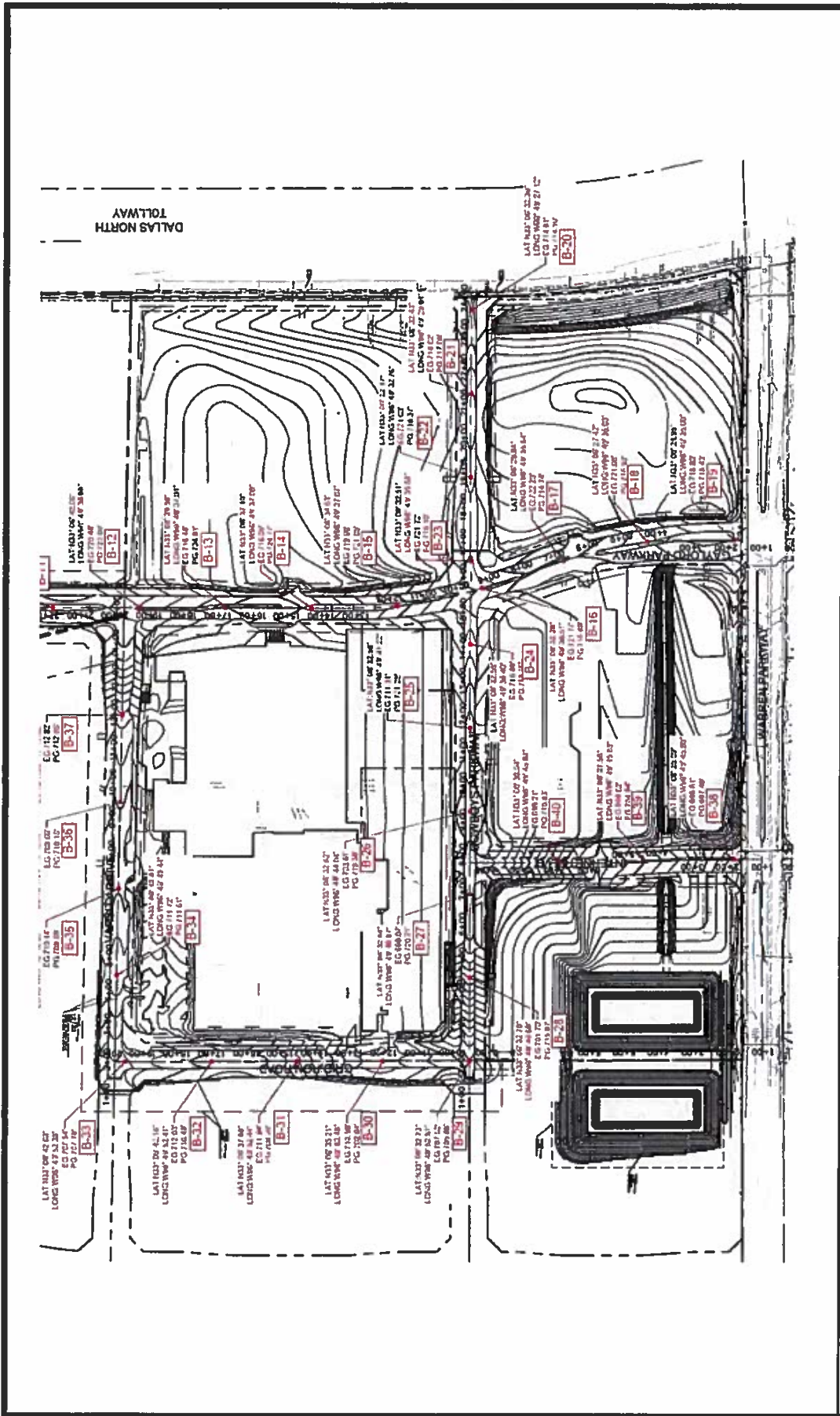
FIGURES



BORING LOCATION PLAN
 Frisco Events Center Roadways
 Frisco, Texas
 Project E14-0503 June 2014



Figure 1a



BORING LOCATION PLAN
 Frisco Events Center Roadways
 Frisco, Texas
 Project E14-0503
 June 2014



Figure 1b

LOG OF BORING B-1

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/14/2014** Elev.: **708.87'**

Location: **See Figure 1**


Depth to water at completion of boring: **9'**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		Brown & dark brown <u>CLAY</u> w/ gravel (FILL)						4.25			
707.5		Dark brown <u>CLAY</u> w/ limestone fragments and crushed stone (FILL)						4.5+			
								4.5++			
-2.5				18	55	20	35	56	106	4.5	
										4.5+	
705			Light brown & brown <u>CLAY</u> w/ limestone fragments & calcareous nodules	27					97	2.0	
-5										2.8	
702.5		Tan <u>CLAY</u> w/ calcareous nodules, slightly sandy							2.5		
									2.9		
-7.5		Tan <u>CLAY</u> w/ severely weathered limestone							1.8		
700		Boring terminated at 10'									
-10											
697.5											
-12.5											
695											
-15											
692.5											
-17.5											

Notes: **Fill 1.56' to proposed subgrade.**

FIGURE:2

LOG OF BORING B-2

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/14/2014 Elev.: 707.15'

Location: See Figure 1





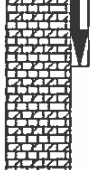


Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Gray severely weathered <u>LIMESTONE</u> , highly fractured (FILL)							4.5		
2.5		Dark brown <u>CLAY</u> w/ limestone fragments	20					109	4.5		
5		Light brown <u>CLAY</u> w/ limestone fragments & gravel	16	54	20	34	48	109	4.0		
702.5		Tan severely weathered <u>LIMESTONE</u> , highly fractured w/ clay seams & layers							4.5		
700		Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams							4.0		
701.5	 50/1 5" 50/1"										
697.5	 50/1 25" 50/1"										
10		Boring terminated at 10'									
695											
12.5											
692.5											
15											
690											
17.5											

Notes: Fill 2.54' to proposed subgrade.

FIGURE:3

LOG OF BORING B-3

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/14/2014** Elev.: **713.43'**

Location: **See Figure 1**


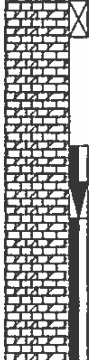
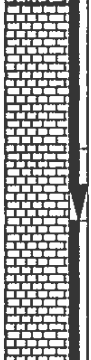

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0 712.5		Dark brown & brown <u>CLAY</u> w/ limestone fragments & severely weathered broken limestone (FILL)	18						3.75		
2.5 710	 50/0.5" 50/0.25"	Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
5 707.5	 50/0.5" 50/0.25"	Hard gray <u>LIMESTONE</u>									
7.5 705	 50/0.5" 50/0.25"										
10 702.5		Boring terminated at 12'									
12.5 700											
15 697.5											
17.5 695											

Notes: Fill 1.79' to proposed subgrade.

FIGURE:4

LOG OF BORING B-4

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/14/2014 Elev.: 718.48'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p> <p>717.5</p> <p>2.5</p> <p>715</p> <p>5</p> <p>712.5</p> <p>7.5</p> <p>710</p> <p>10</p> <p>707.5</p> <p>12.5</p> <p>705</p> <p>15</p> <p>702.5</p> <p>17.5</p> <p>700</p> </div> <div style="flex: 1;"> </div> </div>		<p>Gray brown & tan <u>CLAY</u> w/ limestone fragments (FILL)</p> <p>Moderately hard to hard tan <u>weathered LIMESTONE</u>, fractured, w/ clay seams</p> <p>Boring terminated at 10'</p>	21						4.5++ 4.5++		

Notes: Fill 4.56' to proposed subgrade.

FIGURE:5

LOG OF BORING B-5

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/15/2014 Elev.: 726.69'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0 725 -2.5 722.5 -5 720 -7.5 717.5 -10 715 -12.5 712.5 -15 710 -17.5		Tan severely weathered <u>LIMESTONE</u> w/ clay seams, highly fractured Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams Hard gray <u>LIMESTONE</u> Boring terminated at 11'							4.5 4.5++ 4.5++		

Notes: Fill 0.87' to proposed subgrade.

FIGURE:6

LOG OF BORING B-6

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 726.88'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p> <p>725</p> <p>2.5</p> <p>722.5</p> <p>5</p> <p>720</p> <p>7.5</p> <p>717.5</p> <p>10</p> <p>715</p> <p>12.5</p> <p>712.5</p> <p>15</p> <p>710</p> <p>17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u>	10						4.5++		
		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured							4.5++		
		Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams & calcareous nodules									
		Hard gray <u>LIMESTONE</u>									
		Boring terminated at 10'									

Notes: Fill 0.03' to proposed subgrade.

FIGURE:7

LOG OF BORING B-7

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 723.1'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u>										
722.5		Tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured										
-2.5		Moderately hard to hard tan <u>weathered Limestone</u> , fractured, w/ clay seams & calcareous nodules										
720		Hard gray <u>Limestone</u> w/ shale seams										
-5												
717.5												
-7.5												
715												
-10												
712.5		Boring terminated at 10'										
-12.5												
710												
-15												
707.5												
-17.5												
705												

Notes: Fill 1.76' to proposed subgrade.

FIGURE:8

LOG OF BORING B-8

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 721.87'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p> <p>720</p> <p>-2.5</p> <p>717.5</p> <p>5</p> <p>715</p> <p>-7.5</p> <p>712.5</p> <p>10</p> <p>710</p> <p>-12.5</p> <p>707.5</p> <p>15</p> <p>705</p> <p>-17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u>							4.5++		
			27	83	32	51	98	96	4.5++		
			27					98	4.5+		
									4.5++		
		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
		Boring terminated at 10'									

Notes: Fill 0.54' to proposed subgrade.

FIGURE:9

LOG OF BORING B-9

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 721.03'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u>	22						4.5++		
720			24				104	4.5++			
-2.5			Brown <u>CLAY</u>	27			94	95	4.5+		
717.5									4.5		
5		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
715		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
-7.5											
712.5											
10		Boring terminated at 10'									
710											
-12.5											
707.5											
-15											
705											
-17.5											

Notes: Fill 2.11' to proposed subgrade.

FIGURE:10

LOG OF BORING B-10

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 722.49'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u> w/ limestone fragments & organics	13									
		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured										
720 2.5			Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams									
717.5 5			Tan & gray weathered <u>LIMESTONE</u>									
715 7.5			Hard gray <u>LIMESTONE</u>									
712.5 10		Boring terminated at 10'										
710 12.5												
707.5 15												
705 17.5												

Notes: Fill 1.61' to proposed subgrade.

FIGURE:11

LOG OF BORING B-11

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 722.72'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>722.5 0</p> <p>720 2.5</p> <p>717.5 5</p> <p>715 7.5</p> <p>712.5 10</p> <p>710 12.5</p> <p>707.5 15</p> <p>705 17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u> w/ organic	12	51	19	32	58		4.5++		
		Tan <u>severely weathered LIMESTONE</u> w/ clay layers, highly fractured									
		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
		Hard gray <u>LIMESTONE</u>									
		Boring terminated at 12'									

Notes: Cut 1.8' to proposed subgrade.

FIGURE:12

LOG OF BORING B-12

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/21/2014 Elev.: 720.48'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ limestone seams	12	54	20	34	46		4.5++		
2.5		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
5		Hard gray <u>LIMESTONE</u>									
10		Boring terminated at 10'									
17.5											

Notes: Fill 1.61' to proposed subgrade.

FIGURE:13

LOG OF BORING B-13

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 716.48'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN lsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u> w/ limestone fragments	23	62	23	39	66	101	4.5++			
715		Tan <u>calcareous CLAY</u> w/ calcareous deposits										
-2.5		Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams								4.5++		
712.5		50/3" 50/2.5"								4.5++		
5		50/2" 50/2"										
710		Hard gray <u>LIMESTONE</u>										
-7.5		Boring terminated at 10'										
707.5	50/0.5" 50/0.5"											
10												
705												
-12.5												
702.5												
15												
700												
-17.5												

Notes: Fill 8.43' to proposed subgrade.

FIGURE:14

LOG OF BORING B-14

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 716.09'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ limestone fragments							4.5++		
715		Tan <u>CLAY</u> w/ limestone fragments	17					111	4.5++		
-2.5				19	43	19	24	110	4.5++		
712.5		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured								4.5++	
-5		Moderately hard to hard tan weathered <u>LIMESTONE</u> , fractured, w/ clay seams & calcareous nodules									
710											
-7.5											
707.5											
-10		Boring terminated at 10'									
705											
-12.5											
702.5											
-15											
700											
-17.5											

Notes: Fill 8.68' to proposed subgrade.

FIGURE:15

LOG OF BORING B-15

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/19/2014** Elev.: **719.96'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ limestone seams	22	66	25	41	90	103	4.5++		
717.5 - 2.5		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
715 - 5		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
712.5 - 7.5		Hard gray <u>LIMESTONE</u> w/ shale seams									
710 - 10		Boring terminated at 10'									
707.5 - 12.5											
705 - 15											
702.5 - 17.5											

Notes: **Fill 1.09' to proposed subgrade.**

FIGURE:16

LOG OF BORING B-16

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/22/2014 Elev.: 721.77'

Location: See Figure 1



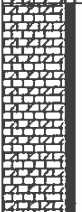
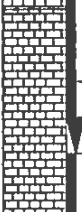
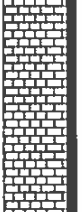


Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ organic									
720 -2.5	 50/3.5" 50/2.5"	Moderately hard to hard tan <u>weathered LIMESTONE</u> w/ clay seams, fractured									
717.5 -5	 50/3" 50/2"	Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured									
715 -7.5		Hard gray <u>LIMESTONE</u>									
712.5 -10	 50/1.5" 50/1"										
710 -12.5											
707.5 -15	 50/0.75" 50/0.5"	Boring terminated at 16'									
705 -17.5											

Notes: Cut 5.08' to proposed subgrade.

FIGURE:17

LOG OF BORING B-17

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/22/2014 Elev.: 722.29'

Location: See Figure 1


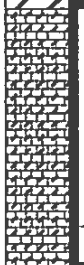
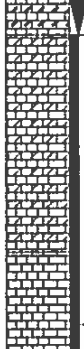
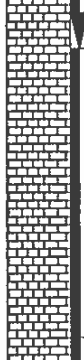
Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u>									
720 -2.5		Soft to moderately hard tan <u>severely weathered LIMESTONE</u> w/ clay seams, fractured									
717.5 -5	50/2" 50/1"	Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured									
715 -7.5		Hard gray <u>LIMESTONE</u> w/ shale seams									
712.5 -10	50/1" 50/1"										
710 -12.5											
707.5 -15	50/0.5" 50/0.5"										
705 -17.5	50/0.5" 50/0.25"	Boring terminated at 18'									

Notes: Cut 7.55' to proposed subgrade.

FIGURE:18

LOG OF BORING B-18

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/22/2014** Elev.: **721.06'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u>								45++		
720		Soft to moderately hard tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured										
-2.5												
717.5												
-5		Moderately hard tan & gray <u>weathered Limestone</u> , fractured										
715												
-7.5		Hard gray <u>Limestone</u>										
712.5												
-10		Boring terminated at 15'										
710												
-12.5												
707.5												
-15												
705												
-17.5												

Notes: **Cut 4.13' to proposed subgrade.**

FIGURE:19

LOG OF BORING B-19

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/15/2014 Elev.: 718.83'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0	[Diagonal Hatching]	Dark brown <u>CLAY</u> w/ limestone fragments	28	68	27	41	85	94	4.2		
717.5	[Cross-hatching]	Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
-2.5	[Cross-hatching]	Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
715	[Cross-hatching]	Hard gray <u>LIMESTONE</u>									
-5	[Cross-hatching]	Boring terminated at 11'									
712.5	[Cross-hatching]										
-7.5	[Cross-hatching]										
710	[Cross-hatching]										
-10	[Cross-hatching]										
707.5	[Cross-hatching]										
-12.5	[Cross-hatching]										
705	[Cross-hatching]										
-15	[Cross-hatching]										
702.5	[Cross-hatching]										
-17.5	[Cross-hatching]										

Notes: Cut 0.4' to proposed subgrade.

FIGURE:20

LOG OF BORING B-20

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/15/2014 Elev.: 714.81'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Brown <u>CLAY</u> w/ limestone fragments	23	67	26	41	94	101	4.5++		
712.5 -2.5		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
710 -5		Hard gray <u>LIMESTONE</u> w/ shale seams									
707.5 -7.5											
705 -10											
702.5 -12.5		Boring terminated at 11'									
700 -15											
697.5 -17.5											

Notes: Cut 0.71' to proposed subgrade.

FIGURE:21

LOG OF BORING B-21

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 718.62'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u>							4.5++			
717.5		Tan <u>CLAY</u> w/ some weathered limestone seams	21	51	20	31	64	105	4.5++			
-2.5		Tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured							102	4.5++		
715		Hard gray <u>LIMESTONE</u> w/ shale seams										
-5		Boring terminated at 12'										
712.5												
-7.5												
710												
-10												
707.5												
-12.5												
705												
-15												
702.5												
-17.5												

Notes: Cut 1.54' to proposed subgrade.

FIGURE:22

LOG OF BORING B-22

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 721.03'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0 720 2.5 717.5 5 715 7.5 712.5 10 710 12.5 707.5 15 705 17.5		Dark brown <u>CLAY</u> Moderately hard tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured Hard gray <u>LIMESTONE</u> w/ shale seams Boring terminated at 15'									

Notes: Cut 4.66' to proposed subgrade.

FIGURE:23

LOG OF BORING B-23

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 721.72'

Location: See Figure 1

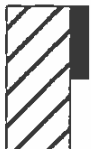
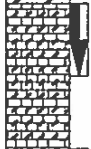
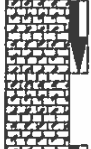
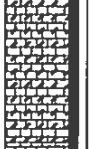
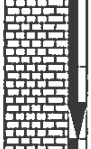

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u>							4.5++		
720									4.5++		
-2.5	 50/2" 50/0.5"	Moderately hard to soft tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
717.5	 50/0.5" 50/25"										
-5											
715											
-7.5											
712.5	 50/0.5" 50/0.5"	Hard gray <u>LIMESTONE</u> w/ shale layers									
-10											
710											
-12.5											
707.5	 50/0.75" 50/0.25"										
-15											
705	 50/0.5" 50/0.25"										
-17.5		Boring terminated at 16'									

Notes: Cut 5.62' to proposed subgrade.

FIGURE:24

LOG OF BORING B-24

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 719.89'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u>							4.5++		
717.5 2.5		Moderately hard to soft tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured	14								
715 5		Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams									
712.5 7.5		Hard gray <u>Limestone</u> w/ shale seams									
710 10											
707.5 12.5		Boring terminated at 12'									
705 15											
702.5 17.5											

Notes: Cut 1.33' to proposed subgrade.

FIGURE:25

LOG OF BORING B-25

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 711.31'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %	
0		Dark brown <u>CLAY</u> w/ limestone fragments	17						4.5++			
710		Moderately hard to soft tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured										
-2.5		Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams										
707.5		Hard gray <u>Limestone</u> w/ shale seams										
-5		Boring terminated at 10'										
705												
-7.5												
702.5												
-10												
700												
-12.5												
697.5												
-15												
695												
-17.5												

Notes: Fill 9.97' to proposed subgrade.

FIGURE:26

LOG OF BORING B-29

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 707.52'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %	
707.5 - 0		Dark brown <u>CLAY</u> w/ tan weathered limestone fragments							4.5++			
		Moderately hard to soft tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured										
705 - 2.5		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams										
702.5 - 5			Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
700 - 7.5			Hard gray <u>LIMESTONE</u> w/ shale seams									
697.5 - 10			Boring terminated at 12'									
695 - 12.5												
692.5 - 15												
690 - 17.5												

Notes: Cut 1.64' to proposed subgrade.

FIGURE:27

LOG OF BORING B-30

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/22/2014 Elev.: 710.98'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0 710 -2.5 707.5 5 705 7.5 702.5 10 700 12.5 697.5 15 695 17.5 692.5		Dark brown <u>CLAY</u> w/ tan weathered limestone fragments Soft to moderately hard tan <u>severely weathered LIMESTONE</u> w/ clay seams, fractured Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured Hard gray <u>LIMESTONE</u>									

Notes: Cut 8.34' to proposed subgrade.

FIGURE:28

LOG OF BORING B-30

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/22/2014 Elev.: 710.98'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
		<p>Boring terminated at 19'</p>									

Notes: Cut 8.34' to proposed subgrade.

FIGURE:29

LOG OF BORING B-31

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: _____

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked: _____

was:

Depth to caving when checked: _____

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ tan weathered limestone fragments							4.5++		
-2.5		Moderately hard to soft tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
-5		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
-12.5		Hard gray <u>LIMESTONE</u>									
-15		Boring terminated at 14'									
-17.5											

Notes: Cut 3.66' to proposed subgrade.

FIGURE:29

LOG OF BORING B-32

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 712.03'

Location: See Figure 1



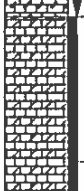

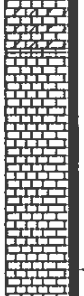

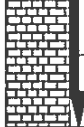
Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		Dark brown <u>CLAY</u> w/ tan weathered limestone fragments	11	44	19	25	67		45++		
710	 50/2.5" 50/1.5"	Moderately hard to soft tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured									
710-2.5		Moderately hard to hard tan <u>weathered Limestone</u> , fractured, w/ clay seams									
707.5	 50/1" 50/1"	Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams									
705		Hard gray <u>Limestone</u>									
702.5	 50/0.5" 50/0.5"										
700	 50/0.5" 50/0.25"	Boring terminated at 12'									
697.5											
695											

Notes: Cut 1.54' to proposed subgrade.

FIGURE:30

LOG OF BORING B-33

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 707.54'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %	
707.5 0		Moderately hard to soft tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured							4.5++			
705 2.5		Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams										
702.5 5		Hard gray <u>Limestone</u>										
700 7.5												
697.5 10		Boring terminated at 11'										
695 12.5												
692.5 15												
690 17.5												

Notes: Fill 0.24' to proposed subgrade.

FIGURE:31

LOG OF BORING B-34

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 711.72'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p> <p>710</p> <p>-2.5</p> <p>707.5</p> <p>-5</p> <p>705</p> <p>-7.5</p> <p>702.5</p> <p>-10</p> <p>700</p> <p>-12.5</p> <p>697.5</p> <p>-15</p> <p>695</p> <p>-17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u>							4.5++		
			15	51	19	32	73	113	4.5++		
		Moderately hard to soft tan <u>severely weathered Limestone</u> w/ clay seams, highly fractured							4.5++		
									4.5++		
		Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams									
		Hard gray <u>Limestone</u>									
		Boring terminated at 11'									

Notes: Cut 0.11' to proposed subgrade.

FIGURE:32

LOG OF BORING B-35

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/19/2014** Elev.: **710.14'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %	
710 0		Dark brown <u>CLAY</u>	27					95	4.5++			
707.5 2.5		Brown <u>CLAY</u> w/ limestone fragments	22	63	23	40	76	104	4.5++			
705 5		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams							4.5++			
702.5 7.5		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams										
700 10		Hard gray <u>LIMESTONE</u>										
697.5 12.5		Boring terminated at 11'										
695 15												
692.5 17.5												

Notes: **Cut 0.26' to proposed subgrade.**

FIGURE:33

LOG OF BORING B-36

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/19/2014 Elev.: 709.66'

Location: See Figure 1

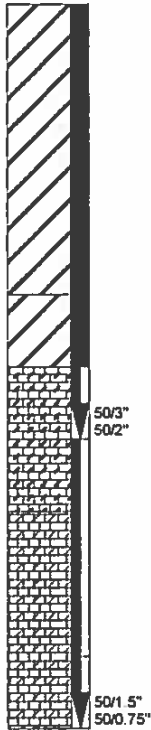
Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0 707.5 2.5 705 5 702.5 7.5 700 10 697.5 12.5 695 15 692.5 17.5		Dark brown <u>CLAY</u> w/ trace limestone Tan <u>CLAY</u> w/ clay seams & calcareous deposits. Moderately hard to soft tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams Boring terminated at 10'									
			25	74	26	48	91	100	4.5		
			27					100	4.0		
									4.5++		
									4.5++		

Notes: Fill 0.5' to proposed subgrade.

FIGURE:34

LOG OF BORING B-37

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/19/2014** Elev.: **712.82'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
712.5 0		Dark brown <u>CLAY</u>							4.5++		
710 2.5		Tan <u>calcareous CLAY</u> w/ severely weathered limestone seams	19	44	19	25	73	107	4.5++		
707.5 5		Soft to moderately hard tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured							4.5++		
705 7.5		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
702.5 10		Hard gray <u>LIMESTONE</u> w/ shale seams									
697.5 15			Boring terminated at 11'								
695 17.5											

Notes: **Fill 0.03' to proposed subgrade.**

FIGURE:35

LOG OF BORING B-38

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/23/2014 Elev.: 698.61'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
0 697.5 2.5 695 5 692.5 7.5 690 10 687.5 12.5 685 15 682.5 17.5		Moderately hard tan & gray <u>weathered Limestone</u> , fractured, w/ clay seams (FILL) Dark brown <u>CLAY</u> Moderately hard to soft tan <u>severely weathered</u> <u>Limestone</u> w/ clay seams, highly fractured Hard gray <u>Limestone</u> Boring terminated at 10'							45++		

Notes: Cut 1.12' to proposed subgrade.

FIGURE:36

LOG OF BORING B-39

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/23/2014 Elev.: 698.62'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p> <p>697.5</p> <p>-2.5</p> <p>695</p> <p>5</p> <p>692.5</p> <p>-7.5</p> <p>690</p> <p>10</p> <p>687.5</p> <p>-12.5</p> <p>685</p> <p>15</p> <p>682.5</p> <p>-17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u>							4.5++		
		Tan <u>calcareous CLAY w/ severely weathered limestone</u>	24	78	28	50		101	4.5++		
		Moderately hard to hard tan <u>weathered LIMESTONE</u> , fractured, w/ clay seams	18	42	18	24	70	113	4.5++		
		Boring terminated at 11'									

Notes: fill 6.32' to proposed subgrade.

FIGURE:37

LOG OF BORING B-41

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/22/2014** Elev.: **727.76'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %
727.5		Dark brown <u>CLAY</u>	18	55	20	35			4.5++		
725		Moderately hard to soft tan <u>severely weathered LIMESTONE</u> w/ clay seams, highly fractured									
722.5		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
720		Dark gray <u>LIMESTONE</u>									
717.5		Boring terminated at 10'									
715											
712.5											
710											

Notes: **Fill 0.92' to proposed subgrade.**

FIGURE:38

LOG OF BORING B-42

Project: **Frisco Event Center - Frisco, Texas**

Project No.: **E14-0503**

Date: **05/22/2014** Elev.: **727.61'**

Location: **See Figure 1**

Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P PEN tsf	UNCON ksf	Strain %	
727.5 - 0		Dark brown <u>CLAY</u>	20	64	23	41			45++			
725 - 2.5		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams										
722.5 - 5		Hard gray <u>LIMESTONE</u>										
720 - 7.5												
717.5 - 10		Boring terminated at 10'										
715 - 12.5												
712.5 - 15												
710 - 17.5												

Notes: **Fill 0.57' to proposed subgrade.**

FIGURE:39

LOG OF BORING B-43

Project: Frisco Event Center - Frisco, Texas

Project No.: E14-0503

Date: 05/22/2014 Elev.: 729.38'

Location: See Figure 1

Depth to water at completion of boring: Dry

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN lsf	UNCON ksf	Strain %
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>0</p><p>727.5</p><p>-2.5</p><p>725</p><p>-5</p><p>722.5</p><p>-7.5</p><p>720</p><p>-10</p><p>717.5</p><p>-12.5</p><p>715</p><p>-15</p><p>712.5</p><p>-17.5</p> </div> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px;"> </div> </div>		Dark brown <u>CLAY</u> w/ limestone fragments	17	63	23	40	80				
		Moderately hard tan & gray <u>weathered LIMESTONE</u> , fractured, w/ clay seams									
		Hard gray <u>LIMESTONE</u>									
		Boring terminated at 10'									

Notes: Fill 0.95' to proposed subgrade.

FIGURE:40

KEY TO LOG TERMS & SYMBOLS

Symbol Description

Strata symbols



CLAY



LIMESTONE,
severely
weathered



LIMESTONE,
weathered



LIMESTONE



CLAY,
calcareous

Misc. Symbols



Water table
at boring
completion



Boring continues

Soil Samplers



Thin Wall
Shelby Tube

Symbol Description



Auger



THD Cone
Penetration
Test



Standard
Penetration
Test

Notes:

1. Exploratory borings were drilled on dates indicated using truck mounted drilling equipment.
2. Water level observations are noted on boring logs.
3. Results of tests conducted on samples recovered are reported on the boring logs. Abbreviations used are:

DD = natural dry density (pcf)	LL = liquid limit (%)
MC = natural moisture content (%)	PL = plastic limit (%)
Uncon. = unconfined compression (tsf)	PI = plasticity index
P.Pen. = hand penetrometer (tsf)	-200 = percent passing #200
4. Rock Cores
 - REC = (Recovery) sum of core sample recovered divided by length of run, expressed as percentage.
 - RQD = (Rock Quality Designation) sum of core sample recovery 4" or greater in length divided by the run, expressed as percentage.

FIGURE:43

SWELL TEST RESULTS

BORING NO.	DEPTH (FEET)	UNIT WEIGHT	ATTERBERG LIMITS			IN-SITU MOISTURE CONTENT	FINAL MOISTURE CONTENT	LOAD (PSF)	% VERTICAL SWELL
			LL	PL	PI				
B-1	2-3	106.4	55	20	35	19.7	22.2	200	2.9
	4-5	97.0	--	--	--	27.3	28.4	200	1.3
B-2	1-2	108.8	--	--	--	19.8	21.7	200	2.6
	4-5	108.8	54	20	34	19.8	21.1	200	1.6
B-8	1-2	96.0	83	32	51	27.7	38.3	200	16.0
	2-3	97.6	--	--	--	26.8	36.7	200	14.6
B-9	1-2	103.7	--	--	--	23.5	33.3	200	15.2
	2-3	94.6	--	--	--	29.2	39.4	200	17.0
B-13	0-1	100.5	62	23	39	22.5	27.1	200	5.7
B-14	1-2	110.9	--	--	--	17.4	19.3	200	1.6
	2-3	110.4	43	19	24	18.6	20.0	200	1.6
B-15	0-1	102.8	66	25	41	22.4	26.9	200	5.7
B-19	0-1	94.3	68	27	41	27.9	29.8	200	2.0
B-20	0-1	100.5	67	26	41	23.2	28.3	200	7.5
B-21	2-3	105.2	51	20	31	20.5	22.9	200	2.0
	3-4	102.2	--	--	--	23.9	25.4	200	1.7
B-34	1-2	112.5	51	19	32	14.9	19.5	200	4.9
B-35	0-1	95.2	--	--	--	27.2	35.0	200	10.3
	1-2	103.8	63	23	40	21.7	26.1	200	5.4
B-36	1-2	99.7	74	26	48	25.1	28.4	200	4.7
	2-3	99.5	--	--	--	26.5	29.2	200	4.2



SWELL TEST RESULTS		
FRISCO EVENTS CENTER ROADWAYS		
FRISCO, TEXAS		
ALLIANCE GEOTECHNICAL GROUP		
E14-0503	Date: 06/19/14	FIGURE 44

SWELL TEST RESULTS (Cont.)

BORING NO.	DEPTH (FEET)	UNIT WEIGHT	ATTERBERG LIMITS			IN-SITU MOISTURE CONTENT	FINAL MOISTURE CONTENT	LOAD (PSF)	% VERTICAL SWELL
			LL	PL	PI				
B-37	1-2	106.6	44	19	25	19.1	22.7	200	1.8
B-39	1-2	101.0	78	28	50	24.4	28.7	200	4.7
	2-3	113.1	42	18	24	17.6	18.5	200	1.0
B-44	0-1	97.3	75	29	46	23.7	35.1	200	13.9
B-45	0-1	111.5	55	22	31	17.7	22.7	200	7.2

PROCEDURE:

1. Sample placed in confining ring, design load applied, free water with surfactant made available, and sample allowed to swell completely.
2. Load removed and final moisture content determined.



SWELL TEST RESULTS		
FRISCO EVENTS CENTER ROADWAYS		
FRISCO, TEXAS		
ALLIANCE GEOTECHNICAL GROUP		
E14-0503	Date: 06/19/14	FIGURE 45

SOLUBLE SULFATES TEST RESULTS (EPA TEST METHOD)

BORING NO.	DEPTH	SOLUBLE SULFATES (PPM)
B-1	2-3	148.5
B-2	1-2	77.97
B-3	0-1	11.40
B-4	0-1	13.26
B-6	0-1	11.47
B-8	1-2	11.64
B-9	0-1	11.76
B-10	0-1	11.76
B-11	0-1	11.62
B-12	0-1	119.5
B-13	0-1	115.0
B-14	1-2	121.0
B-15	0-1	116.1
B-19	0-1	122.1
B-20	0-1	116.7
B-21	2-3	133.5
B-24	1-2	143.0
B-25	0-1	116.3
B-32	0-1	116.6
B-34	1-2	123.3
B-35	1-2	132.5
B-36	1-2	193.3
B-37	1-2	131.1
B-39	1-2	119.7
B-41	0-1	118.8
B-42	0-1	130.8
B-43	0-1	127.7
B-44	0-1	123.2
B-45	1-2	121.1

SOLUBLE SULFATES TESTING

BY

TTI ENVIRONMENTAL LABORATORIES

SOLUBLE SULFATES TEST RESULTS

FRISCO EVENT CENTER ROADWAY

FRISCO, TEXAS

TTI ENVIRONMENTAL LABORATORIES

E14-0503

Date: 06/19/2014

FIGURE: 46

Alliance Geotechnical Group

3228 Halifax Street
Dallas, TX 75247

Tel: 972-444-8889, Fax: 972-444-8893



pH/Lime SERIES TEST RESULTS (Soil-Lime)

Project Name: Frisco Events Center Roadways

Project No: E14-0503

Material Description: Dark brown clay

Sample ID: B-8 (0-3')+B-19 (0-1')+B-21 (1-2')+B-34 (0-2')

Date: 6/6/2014

Tested By: JP

Checked By: HS

Lime (%)	pH
0	7.45
4	12.27
6	12.36
8	12.42
10	12.50

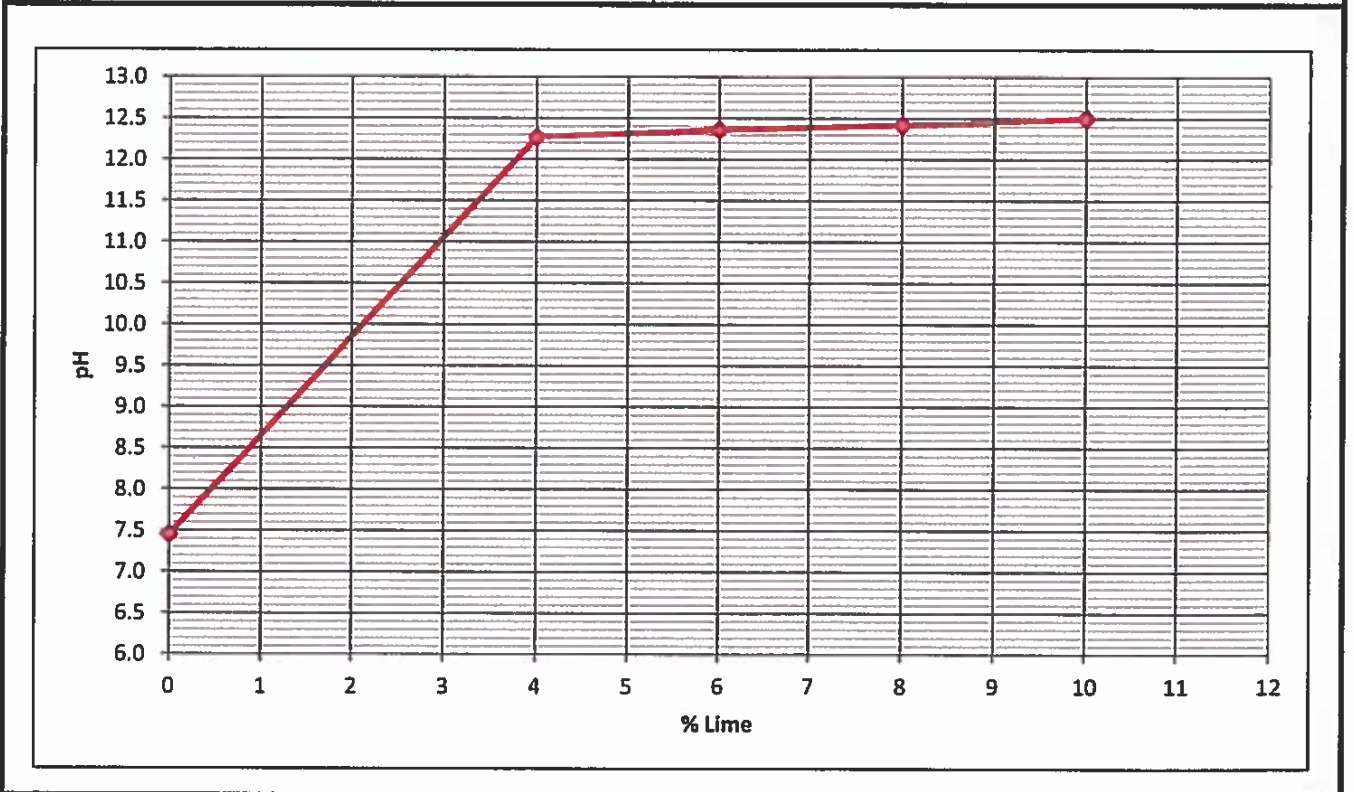


Figure 47

Alliance Geotechnical Group

3228 Halifax Street
Dallas, TX 75247

Tel: 972-444-8889, Fax: 972-444-8893



pH/Lime SERIES TEST RESULTS (Soil-Lime)

Project Name: Frisco Events Center Roadways

Project No: E14-0503

Material Description: Dark brown clay

Sample ID: B-21 (2-4')+B-37 (1-2')+B-39 (2-3')

Date: 06/06/14

Tested By: JP

Checked By: HS

Lime (%)	pH
0	7.80
4	12.30
6	12.38
8	12.44
10	12.54

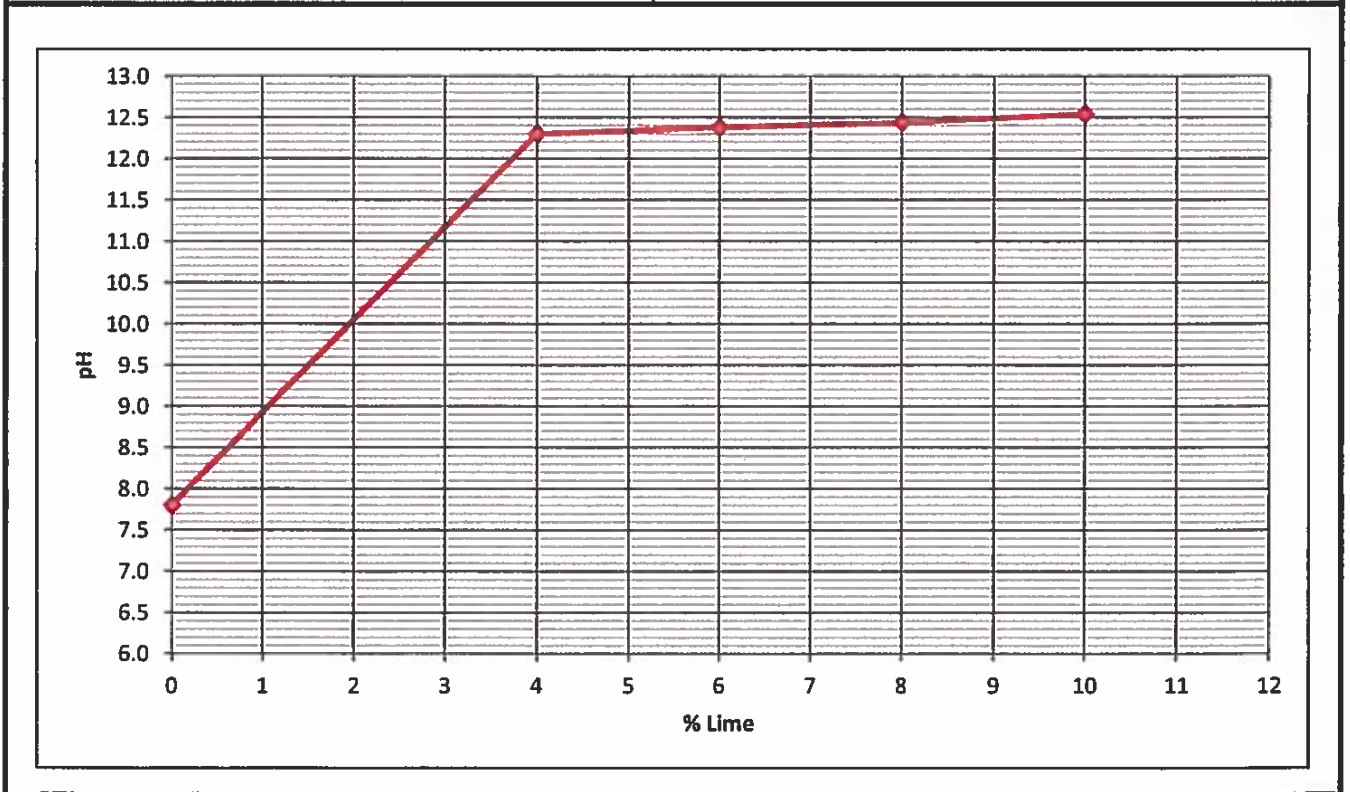


Figure 48