

**SPECIFICATIONS
AND
FORMS OF CONTRACT, BOND AND PROPOSAL
FOR
SOUTH CONWAY LIFT STATION
SANITARY SEWER & WATER LINE IMPROVEMENTS
BETWEEN US 83 AND MILITARY RD.
RFB: 20-179-03-12**

**CITY OF MISSION
HIDALGO COUNTY, TEXAS**

CITY OFFICIALS

**DR. ARMANDO O'CANA
NORIE GONZALEZ GARZA
JESSICA ORTEGA-OCHOA
RUBEN PLATA
JOSE ALBERTO VELA
RANDY PEREZ**

**MAYOR
MAYOR PRO-TEM
COUNCILWOMAN
COUNCILMAN
COUNCILMAN
CITY MANAGER**

2020

**MELDEN AND HUNT, INC.
CONSULTING ENGINEERS
PROJECT NO. 19086.00
TBPE #F-1435**



M. Reyna
2-24-20

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ADVERTISEMENT FOR BIDS

CITY OF MISSION, TEXAS

OWNER

Separate sealed bids for the construction of South Conway Lift Station Sanitary Sewer & Water Line Improvements between US 83 and Military Rd, City of Mission, Texas will be received by the City of Mission, Texas (hereinafter called owner) at the City Manager's Office, City Hall, 1201 E. 8th St., Mission, Texas, 78572 until 2:00 p.m., March 12, 2020, and then at said office publicly opened and read aloud.

The Instructions to Bidders, Form of Bid, Forms of Contract, Plans, Specifications and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

Melden and Hunt, Inc., Consulting Engineers, 115 W McIntyre St., Edinburg, Texas 78541
City of Mission, City Hall, 1201 E 8th St, Mission, Texas

Copies of plans and specifications may be obtained at the office of City of Mission, Purchasing Dept located at 1201 E. 8th St., Mission, Texas 78572 for a fee of \$80.00 per set no refund payable to Melden and Hunt, Inc.

The Owner reserves the right to waive any informalities or to reject any or all bids.

A Pre-bid conference is scheduled for March 5, 2020 at 10:00 am at Mission City Hall.

Each bidder must deposit with his bid, security in the amount form and subject to the conditions provided in the Instructions for Bidders.

Attention of Bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract.

No bidder may withdraw his bid within 30 days after the actual date of the opening thereof.

INSTRUCTIONS TO BIDDERS

Bids will be submitted in sealed envelopes upon the blank form of proposal attached hereto, and marked in the lower left-hand corner with the name of Bidder and Title of Project.

The right is reserved, as the interest of the Owner may require, to reject any and all bids, and to waive any formality in bids received.

In case of ambiguity, or lack of clearness in stating the prices in the bids, the Owner reserves the right to consider the most advantageous construction thereof, or to reject the bid. Unreasonable (or unbalanced) prices will authorize the Owner to reject any bid.

Each bid must be accomplished by Bid Security made payable to the Owner in an amount of 5% of the Bidder's maximum bid price and in the form of a certified or bank check or a Bid Bond issued by a surety meeting the requirements of the General Conditions.

The Bid security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required contract security, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen (15) days after the Notice of Award, Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of others whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the effective date of agreement or the forty-sixth day after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security with Bids which are not competitive will be returned within seven days after the Bid opening.

The successful bidder must furnish performance and payment bond upon the forms which are attached hereto in the amount of 100% of the contract price from an approved surety company holding a permit from the State of Texas to act as surety and acceptable according to the latest list of companies holding certificates of authority from the Secretary of Treasury of the United States.

All bid securities will promptly be returned to the respective bidders except those which the Owner elects to hold until the successful bidder has executed the contract. Thereafter, all remaining securities, including the security of the successful bidder, will be returned.

Bidders shall carefully examine the specifications and other documents, visit the site of the work, and fully inform themselves as to all conditions and matters which can in any way effect the work or the costs thereof. Should the bidder find discrepancies in, or omissions from the specifications or other documents, or should he be in doubt as to their meaning, he should at once notify the Engineer and obtain clarification by addendum prior to submitting any bid.

SPECIAL PROVISIONS

Scope of Work

This project consists of the construction of South Conway Lift Station, Sanitary Sewer & Water Line Improvements between US 83 and Military Rd .

All labor, materials, equipment, supervision and other services required for this construction will be furnished in accordance with plans and specifications as prepared by Melden and Hunt, Inc., Consulting Engineers of Edinburg, Texas.

Schedule and Sequence of Construction

The Contractor shall, prior to beginning work, prepare and submit a proposed schedule of work to the Engineer for his approval.

Traffic

The contractor shall place all barricades, warning signs, of other traffic control devices in conformance with the construction section of the 1980 edition of the Texas Manual of Uniform Traffic Control Devices.

Competency of Bidders

The Bidder must be capable of performing each of the various items of work bid upon. Upon request, the successful Bidder shall submit a complete statement of his financial resources and his experience in similar work. Work necessary for relocation of oil and gas pipeline will be coordinated with owner of the same.

Guarantee of Work

All workmanship, equipment and materials, furnished or installed by the Contractor shall be guaranteed for a period of at least one (1) year against faulty workmanship or defective materials. The warranty period shall begin on the date of acceptance of the project by the Owner and extend for a period of 365 days thereafter. The Owner may at his option, requires that the Contractor post a performance bond in the amount of ten (10) percent of final total cost of the project to provide surety for the guarantee.

Submittals

Any specified prior approved equals requires that the prospective bidders submit any information to the Engineer ten (10) days prior to the bid opening for approval to be used in the preparation of his bid for this project. Technical data on the proposed system shall be submitted as well as standard catalog information which gives surface preparation instructions and application instructions.

Final Clean up

Upon completion of the work and before acceptance and final payment will be made the Contractor shall clean and remove from the site of the work all brush, trash, surplus and discarded materials, temporary services, removed existing pipes and concrete structures and debris of every kind. The Contractor shall leave the site of the work in a neat and orderly condition equal to that which originally existed. Waste materials removed from the site shall be disposed of at locations satisfactory to the Engineer.

BID FOR UNIT PRICE CONTRACT

Place: Mission, Texas

Date: March 12, 2020

Proposal of _____ (hereinafter called "Bidder") * a corporation,
organized and existing under the laws of the State of _____, * a partnership, or an
individual doing business as _____.

To the **City of Mission** (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids RFB #20-179-03-12 for the construction of South Conway Lift Station, Sanitary Sewer & Water Line Improvements between US 83 and Military Rd, City of Mission, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials, and supplies, and to construct the project in accordance with the contract documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written " Notice to Proceed" of the Owner and to fully complete the project within 300 calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of \$250.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 41 of the General Conditions.

Bidder acknowledges receipt of the following addendum:

*Insert corporation, partnership or individual as applicable.

ENGINEER'S ESTIMATE OF QUANTITIES – APPROXIMATE ONLY

<u>No.</u>	<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
WATER IMPROVEMENTS: On site					
1.	12" PVC C900 DR18	10,133	LF	_____	_____
2.	12" Gate valve w/box	11	EA	_____	_____
3.	2" Flush valve w/threaded cap	1	EA	_____	_____
4.	12"x12"x8" Tapping tee & 8" valve	1	EA	_____	_____
5.	12" 90 degree elbow	2	EA	_____	_____
6.	12" 45 degree elbow	14	EA	_____	_____
7.	12" Bend	3	EA	_____	_____
8.	Valve markers	12	EA	_____	_____
9.	Air release valves	4	EA	_____	_____
10.	Fire hydrant w/valve	25	EA	_____	_____
Total Water Improvements: On site			\$	_____	

SANITARY SEWER IMPROVEMENTS:

1.	15" PVC SDR26 (22'-24' cut)	4,999	LF	_____	_____
2.	15" PVC SDR26 (20'-22' cut)	1,912	LF	_____	_____
3.	Manhole (22'-24' cut)	19	EA	_____	_____
4.	Manhole (20'-22' cut)	5	EA	_____	_____

5. Single sanitary sewer service	20	EA	_____	_____
6. Trench excavation protection	6,911	LF	_____	_____
7. Bore 26" steel casing (22' depth)	226	LF	_____	_____
Total Sanitary Sewer Improvements			\$ _____	

SANITARY SEWER LIFT STATION & FORCE MAIN IMPROVEMENTS:

1. Lift station complete structure & site improvements	Lump Sum		_____	_____
2. 8" PVC SDR26 (0'-6' cut)	2,376	LF	_____	_____
3. Trench excavation protection	2,360	LF	_____	_____
4. 2" Air release valve	4	EA	_____	_____
5. 8" 45 degree elbow	18	EA	_____	_____
6. Bore 16" steel casing (15' depth)	50	LF	_____	_____
7. Bore 16" casing SDR26 (6' depth)	425	LF	_____	_____
8. Pavement repair 8' wide strip & Curb & gutter	425	LF	_____	_____
Total Sanitary Sewer Lift Station & Force Main Improvements:			\$ _____	

MISCELLANEOUS IMPROVEMENTS:

1. Demolition & disposal of brush, citrus trees, Buildings & irrigation structures	Lump Sum	_____	_____
Total Miscellaneous Improvements:		\$ _____	

Total Improvements: \$ _____

(Total in Words)

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

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

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Paragraph 46 of the General Conditions. The Bid security attached in the sum _____ is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner cause thereby.

Respectfully submitted:

By: _____

(SEAL-if bid us by a corporation)

(Business Address & Zip Code)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned
as Principal, and _____ as Surety, are hereby held
and firmly bound unto _____,
Owner, _____ . in the penal sum of
_____ for the
payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our
heirs, executors, administrators, successors and assigns. Signed, the _____ day
of _____, 20_____.

The condition of the above obligation is such that whereas the Principal has submitted
to _____ a certain Bid, attached hereto and hereby made a
part hereof to enter into a contract in writing for the _____.

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and affect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

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

_____(L.S.)
Principal

Surety

SEAL

By: _____

•
•

SALES TAX STATEMENT

Project Name: South Conway Lift Station Sanitary Sewer & Water Line Improvements between US 83 and Military Rd

1. The undersigned Contractor is a holder of a valid sales tax permit. The taxpayer number is _____.
2. This contract is a "Separated Contract" and the undersigned contractor provides the City of Mission with the following information:

Total Materials Cost Based Upon
Estimated Quantities \$ _____

Total Services Cost Based Upon
Estimated Quantities \$ _____

Total Contract Price Based
Upon Estimated Quantities \$ _____

NOTE: The total materials cost based upon estimated quantities plus the total services cost based upon estimated quantities must equal the amount shown for the total contract price based upon estimated quantities.

The contract price does not include sales and excise tax by virtue of being a "Separated Contract".

Signature

Contractor

Address

STATE OF TEXAS

This instrument was acknowledged before me on this the ____ day of _____, 20____, by
_____ President of _____ (a corporation), (a partnership), or
(an individual) on behalf of said firm.

NOTARY PUBLIC FOR THE STATE
OF TEXAS

CITY OF OWNER

Secretary or Witness

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of Texas

County of _____

_____, being first duly sworn, deposes and says that:

(1) He is _____, of _____, the Bidder that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such bid;

(3) Such bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid as been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price of the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed) _____

(Title)

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

(Title)

My Commission expires _____

Insurance Requirements for Supply/Services and/or Construction

(a) Required Coverage. The Contractor shall, at all times during the term of this contract and extended terms thereof, provide and maintain the following types of insurance protecting the interests of the City of Mission and the Contractor with limits of liability not less than those specified below.

Commercial General Liability insurance or its equivalent, **listing City of Mission as an additional insured**, providing limits of not less than \$500,000 for bodily injury and property damage per occurrence, consistent with potential exposure to City under the Texas Tort Claims Act. Coverage should include injury to or death of persons and property damage claims arising out of the services, construction, etc. provided with a general aggregate of \$1,000,000, and a products and completed operations aggregate of \$1,000,000. Coverage should include: Damaged to rented premises at a minimum of \$100,000 per occurrence. There shall not be any policy exclusions or limitations for the following as well:

- Contractual Liability covering Contractor's obligations herein
- Personal Injury Advertising Liability
- Medical Payments
- Fire Damage Legal Liability
- Broad Form Property Damage
- Liability for Independent Contractors

(b) Automobile liability insurance policy with combined single limit of at least Five Hundred Thousand Dollars (\$500,000.00) per occurrence, consistent with potential exposure to City under the Texas Tort Claims Act.

(c) Uninsured/Underinsured motorist coverage in an amount equal to the bodily injury limits set forth immediately above;

(d) A Five Hundred Thousand Dollar (\$500,000.00) Comprehensive General Liability insurance policy providing additional coverage to all underlying liabilities of City consistent with potential exposure of City under the Texas Tort Claims Act;

(e) Workers' Compensation and Employers' Liability- insurance is equivalent to State of Texas Workers' Compensation Statutory Limits, providing limits of not less than \$1,000,000 for each accident, each disease per employee \$1,000,000, and policy limit of no less than \$1,000,000. There shall not be any policy exclusions or limitations.

(f) Certificates of Insurance. Before commencing execution of this contract, and within 7 calendar days from date of award of contract, the Contractor shall furnish Original proof of insurance via Certificates of Insurance satisfactory to the City of Mission at the following addresses,

City of Mission
Crissy Cantu, Purchasing Buyer
1201 E. 8th Street, R-101
Mission, TX 78572
Bid # 20-179-03-12

evidencing that insurance as required by paragraph (a) above is in force, stating policy number dates of expiration and limits of liability thereunder. All copies of policies and Certificates of Insurance submitted to the City shall be in a form and content acceptable to the City.

(g) Approval of Forms and Companies. All coverage described in this contract shall be in a form and content satisfactory to the Purchasing Agent. No party subject to the provisions of this contract shall violate or knowingly permit to be violated any of the provisions of the policies of insurance described herein. All insurance should be provided by insurance companies with a Best's rating of A- or better. Please include proof of such rating with your coverage documents.

(h) Additional Insured Endorsement. The policy or policies providing Commercial General Liability, and as otherwise required above, shall be endorsed to name City of Mission, their directors, officers, representatives, agents, and employees as Additional Insureds with respects to operations performed by or on behalf of the Contractor in the performance of this contract via ISO endorsements CG 2037 or its equivalent. The policy shall also be endorsed to name other interests as directed by City of Mission.

(i) Notice of Cancellation or Material Changes. Policies and/or Certificates shall **specifically** provide that a thirty (30) day notice of cancellation, non-renewal, or material change be sent to the City.

(j) Multiple Policies. The limits of liability as required above may be provided by a single policy of insurance or a combination of primary, excess, or umbrella liability policies. But in no event shall the total limit of liability of any one occurrence or accident be less than the amount shown above.

(k) Deductibles. Companies issuing the insurance policies and the Contractor shall have no recourse against the City 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.

(l) Subcontractors. If any part of the work is sublet, the Contractor shall require any and all subcontractors performing work under this contract to carry General Liability and Products, and Construction Liability Insurance, with limits of liability that Contractor shall deem appropriate and adequate to protect the interests of the City. In the event a subcontractor is unable to furnish insurance in accordance to section (a) above, the Contractor shall endorse the subcontractor as an Additional Insured. Insurance certificates for subcontractors shall be furnished to the City of Mission upon request.

(m) No Release. The carrying of the above-described coverage shall in no way be interpreted as relieving the Contractor of any other responsibility or liability under this agreement, or any applicable law, statute, regulation, or order.

Bidders are advised that they must be in compliance with the below mentioned law:

CHAPTER 176 OF THE TEXAS LOCAL GOVERNMENT CODE

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. By law, this questionnaire must be filed with the records administrator of the City of Mission not later than the 7th business day after the date the person becomes aware of facts that require the statement 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.

For more information or to obtain Questionnaire CIQ go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

IF YOU HAVE ANY QUESTIONS ABOUT COMPLIANCE, PLEASE CONSULT YOUR OWN LEGAL COUNSEL. COMPLIANCE IS THE INDIVIDUAL RESPONSIBILITY OF EACH PERSON OR AGENT OF A PERSON WHO IS SUBJECT TO THE FILING REQUIREMENT. AN OFFENSE UNDER CHAPTER 176 IS A CLASS "C" MISDEMEANOR.

Disclosure of Interested Parties

Contractor is to comply with Government Code Section 2252.908 enacted by H.B. 1295, which prohibits a government entity or state agency from entering into certain contracts with a business entity unless the business entity submits a disclosure of interested parties. For more information go to the Texas Ethics Commission web page at: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

(34) Appeal Process

An appeal may be brought by the lowest bidder deemed to have been non-responsive and/or not responsible. Appeals are limited to the following:

1. Matters of bias, discrimination, or conflict of interest
2. Computing errors and alleged improprieties or ambiguities in bid specifications; and
3. Non-compliance with procedures described in solicitation or City Policy.

The appeal must be in writing and shall be filed with the Purchasing Director at:

City of Mission
1201 E. 8th Street, Room R-101
Mission, Texas 78572

Appeals must include the following information:

- a. Name, address, email, telephone and fax number of appellant;
- b. Bid identification number;
- c. A detailed description of the legal and factual basis of the appeal (include any and all relevant documents, diagrams, photos, etc.);
- d. The desired outcome/solution;
- e. Signed and dated

All appeals must be filed within three (3) working days from the date of award by City Council. Untimely appeals will not be considered. Upon receipt of the appeal, the Purchasing Director will have three (3) working days to attempt to clarify or resolve any issues addressed in the request for appeal.

If the appeal is not resolved with the Purchasing Director, then it shall be considered at a public hearing at the next City Council meeting. All determinations made by the City Council are final.

CITY OF MISSION
Attachment 1 to General Terms and Conditions - Schedule of
Subcontractor(s)/Subconsultant(s)

Offerors should provide information on **all** of their prospective subcontractor(s)/subconsultant(s) who submit bids/proposals in support of this solicitation. Use additional sheets as needed.

Project Name: "Construction of the South Conway Lift Station Sanitary Sewer and Water Line Improvements between US 83 and Military Rd." **Solicitation Number:** Bid No: 20-179-03-12

Name of Prime Contractor: _____

NAMES AND ADDRESSES OF SUBCONTRACTOR(S)/SUBCONSULTANT(S)	TYPE OF WORK TO BE PERFORMED	MINORITY OR WOMAN FIRM? (Check all that apply)	PREVIOUS YEAR'S ANNUAL GROSS RECEIPTS
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.
NAME: ADDRESS: PHONE: FAX: E-MAIL: TAX ID #: CONTACT PERSON:	TYPE OF WORK: AGE OF FIRM:	YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES: DBE <input type="checkbox"/> OR MBE <input type="checkbox"/> OR WBE <input type="checkbox"/>	<input type="checkbox"/> less than \$500K <input type="checkbox"/> \$500K - \$2 mil. <input type="checkbox"/> \$2 mil. - \$5 mil. <input type="checkbox"/> more than \$5 mil.

Name/Title of Person completing this form: _____

Signature _____ Date _____

ADDENDA CHECKLIST

Bid of: _____
(Bidder Company Name)

To: City of Mission

Ref.: Construction of the South Conway Lift Station Sanitary Sewer and Water Line Improvements between US 83 and Military Rd. RFB No.: 20-179-03-12

Ladies and Gentlemen:

The undersigned Bidder hereby acknowledges receipt of the following Addenda to the captioned RFB (initial if applicable).

No. 1 _____ No. 2 _____ No. 3 _____ No. 4 _____ No. 5 _____

Respectfully submitted,

Bidder: _____

By: _____

(Authorized Signature for Bidder)

Name: _____

Title: _____

Date: _____

AGREEMENT

STATE OF TEXAS)

COUNTY OF HIDALGO)

THIS AGREEMENT, made and entered into this ____ of ____ A.D., 2020 by and between

The CITY OF MISSION of the County of Hidalgo

and State of Texas, acting through its representative hereunto duly authorized so to do,

hereinafter termed OWNER, and on behalf of _____ as a

_____, City of Mission, County of Hidalgo, State Of Texas, hereinafter

termed CONTRACTOR.

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

**PROJECT: South Conway Lift Station Sanitary Sewer & Water Line
Improvements between US 83 and Military Rd**

BID DATE: _____ \$ _____

and all extra work in connection therewith, for the unit price shown in the attached proposal incorporated herein by reference, (the "Proposal"), under the terms as stated in the General Conditions of the Agreement and Addendum; and at CONTRACTOR'S own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said construction in accordance with the conditions and prices stated in the Proposal and in accordance with the Plans, which includes all maps, plans, blueprints, and other drawings and printed or written explanatory matter thereof, and the Specifications therefore as prepared by Melden and Hunt, Inc., Consulting Engineers, herein entitled the ENGINEER, each of which has been identified by the endorsement of the CONTRACTOR and the ENGINEER thereon, together with the Payment and Performance Bonds hereto attached; all of which are made a part hereof and collectively evidence and constitute the entire contract.

The CONTRACTOR hereby agrees to commence work within ten (10) days after the date written notice to do so shall have been given to him, and to substantially complete the same within 300 calendar days after the date of the written notice to commence work.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract in accordance with the Proposal submitted therefore, subject to additions and deductions, as provided in the General Conditions of the Agreement and to make payments on account thereof as provided therein, payment to be made in Mission, Hidalgo County, Texas.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in the year and day first above written.

CITY OF MISSION, TEXAS

OWNER

ATTEST:

Secretary

CONTRACTOR

ATTEST:

Secretary

PERFORMANCE BOND

(To be used in Texas under Govt Code Ch 2253)

THE STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That we (1) _____
a (2) _____ of _____ hereinafter called Principal and
(3) _____ of _____, State of _____,
hereinafter called the Surety, are held and firmly bound into (4) _____
the Surety, are held and firmly bound unto (4) _____
of _____, hereinafter called Owner, in the penal sum of _____
_____ (\$ _____) Dollars in lawful money of the United

States, to be paid in (5) _____ for the payment of which sum well and truly to
be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and
severally, firmly by these presents:

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a
certain contract with (6) _____
the Owner, dated the _____ day of _____, A.D., 20 _____, a copy of which is hereto
attached and made a part hereof for the construction :

These footnotes refer to the numbers in body of contract above:

Date of Bond must not be prior to date of Contract.

- (1) Correct Name of Contractor
- (2) A Corporation, Partnership or Individual, as case may be
- (3) Correct Name of Surety
- (4) Correct Name of Owner
- (5) County and State
- (6) Owner

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform the work in accordance with the plans, specifications and contract documents during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed upon this bond, venue shall lie _____ County, State of Texas, and that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, this the _____ day of _____, A.D., 20 _____.

Principal

ATTEST:

(Principal) Secretary

BY _____

(SEAL)

Address

Witness as to Principal)

Address

ATTEST

(Surety) Secretary
(SEAL)

BY _____
Attorney-in-fact

Address

Witness as to Surety

PAYMENT BOND

(To be used in Texas under V.A.T.S. 5160)

THE STATE OF _____

COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That we (1) _____

_____ a (2) _____ of _____

hereinafter called Principal and (3) _____

of _____, State of _____, hereinafter called the Surety,

are held and firmly bound unto (4) _____

_____ of _____, hereinafter called Owner, and unto all person, firms, and corporations who may furnish materials for, or perform labor upon the building or improvements hereinafter referred to in the penal sum of _____ (\$ _____) Dollars in lawful money of the United States, to be paid in (5) _____, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into
a _____ certain _____ contract _____ with
(6) _____

the Owner, dated the _____ day of _____, A.D., 20____, a copy of which is hereto attached and made a part hereof for the construction of:

These footnotes refer to the numbers in body of contract above:

Date of Bond must not be prior to date of Contract.

(1) Correct name of Contractor

(2) A Corporation, a Partnership or an Individual, as case may be

(3) Correct Name of Surety

(4) Correct Name of Owner

(5) County and State

(6) Owner

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NOW, THEREFORE, the condition of this obligation is such that if the Principal shall promptly make payment to all claimants as defined in Article 5160 Revised Civil Statutes of Texas, 1925, as amended by House Bill 344, Acts 56th legislature, Regular Session, 1959, effective April 27, 1959, supplying labor and materials in the prosecution of the work provided for in said Contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

This bond is made and entered into solely for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said Contract, and all such claimants shall have a direct right of action under the bond as provided in Article 5160, Revised Civil Statutes 1925, as amended by House Bill 344, Acts 56th Legislature, Regular Session, 1959.

PROVIDED FURTHER, that if any legal action be filed upon this bond, venue shall lie Hidalgo County, State of Texas, and that the said surety, for value received hereby stipulates and agrees that no change, to the work to be performed thereunder or the specifications 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 or to the specifications.

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

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, this the _____ day of _____ A.D., 20____.

ATTEST:

(SEAL)

Witness as to Principal

Address

Principal

BY _____

Address

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ATTEST:

Surety

(Surety) Secretary

BY _____

(SEAL)

Witness as to Surety

Address

NOTE: If Contractor is partnership, all partners should execute bond.

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon. and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Date: _____

GENERAL BUSINESS QUESTIONNAIRE
(SUPPLIES, SERVICES AND CONSTRUCTION)

This questionnaire, the requested list of references and the authorization to release financial information are used in part to assist in determining a potential contractor's responsibility. Offerors shall submit the General Business Questionnaire information within two (2) work days from the date of notification by the City, or with the offer, if so indicated in the Table of Contents page 2 of the Solicitation, Offer and Award Form. All information must be current and traceable. Each venturer of a joint venture must submit a separate signed form.

City of Mission reserves the right to make additional inquiries based on information submitted, or the lack thereof. Questions concerning this questionnaire or the authorization form should be directed to the contact person identified on the Solicitation, Offer and Award Form. In cases where a question does not apply or if unable to respond, offeror should refer to the item number, repeat the question, and indicate N/A (Not Applicable) or N/R (No Response), as appropriate. Offeror will explain the reason when responding N/A or N/R.

1. Name of Offeror ("Business"): _____
2. List name(s) and business address of officers and directors for corporations, partners for partnerships, and venturers for joint ventures (attach additional pages as necessary).

3. Number of years in business under present business name: _____
4. If applicable, list all other names under which the Business identified above operated in the last 5 years.

5. Annual Gross Revenue (Past year): (M represents millions, K represents thousands)
☐ \$100K or less ☐ \$100K-\$500K ☐ \$500K-\$1M ☐ \$1M-\$5M ☐ \$5M-\$10M
☐ \$10M-\$16M ☐ \$16M or Over
6. Will bidder/proposer provide a copy of its financial statements for the past two (2) years, if requested by City of Mission? ☐ Yes ☐ No
7. Number of current employees: _____
8. Has the Business, or any officer or partner thereof, failed to complete a contract? ☐ Yes ☐ No
9. Is any litigation pending against the Business? ☐ Yes ☐ No
10. Is offeror currently for sale or involved in any transaction to expand or to become acquired by another business entity? If yes, offeror needs to explain the expected impact, both in organizational and directional terms. ☐ Yes ☐ No

11. Has the Business ever been declared "not responsible" for the purpose of any governmental agency contract award? ☐Yes ☐No
12. Has the Business been debarred, suspended, proposed for debarment, declared ineligible, voluntarily excluded, or otherwise disqualified from bidding, proposing, or contracting? ☐Yes ☐No
13. Are there any proceedings pending relating to the Business' responsibility, debarment, suspension, voluntary exclusion, or qualification to receive a public contract? ☐Yes ☐No
14. Has the government or other public entity requested or required enforcement of any of its rights under a surety agreement on the basis of a default or in lieu of declaring the Business in default? ☐Yes ☐No
15. Is the Business in arrears on any contract or debt? ☐Yes ☐No
16. Has the Business been a defaulter, as a principal, surety, or otherwise? ☐Yes ☐No
17. Have liquidated damages or penalty provisions been assessed against the Business for failure to complete work on time or for any other reason? ☐Yes ☐No
18. Does offeror have a contingency plan or disaster recovery plan in the event of a disaster? If so, then Bidder will provide a copy of the plan. ☐Yes ☐No
19. Does offeror have quality assurance program? If yes, offeror will describe its quality assurance program, its quality requirements, and how they are measured. ☐Yes ☐No
20. If a "yes" response is given under questions 9 through 19, please provide a detailed explanation including dates, reference to contract information, contacts, etc. (attach additional pages as necessary).

I, individually and on behalf of the business named in this Business Questionnaire, do by my signature below, certify that the information provided in this questionnaire is true and correct. I understand that any false statements or misrepresentations regarding the Business named above may result in: 1) termination of any or all contracts which City of Mission has or may have with the Business; 2) disqualification of the Business from consideration for contracts; 3) removal of the Business from City of Mission's vendors' list; or/and 4) legal action(s) applicable under federal, state, or local law.

Name: _____ Title: _____

Signature: _____ Date: _____
(Owner, CEO, President, Majority Stockholder or Designated Representative)

LIST OF REFERENCES FOR SIMILAR PROJECTS

Use additional pages as necessary.

1. Project:
Date of Completion (if applicable):
Contact Person:
Company Name:
Address:
Telephone Number:
Fax Number:
E-mail Address:

2. Project:
Date of Completion (if applicable):
Contact Person:
Company Name:
Address:
Telephone Number:
Fax Number:
E-mail Address:

3. Project:
Date of Completion (if applicable):
Contact Person:
Company Name:
Address:
Telephone Number:
Fax Number:
E-mail Address:

4. Project:
Date of Completion (if applicable):
Contact Person:
Company Name:
Address:
Telephone Number:
Fax Number:
E-mail Address:

GENERAL CONDITIONS OF THE AGREEMENT

1. OWNER. Whenever the word OWNER, or the expression, Party of the First Part, or First Party, is used in this contract, it shall be understood as referring to City of Mission.

2. CONTRACTOR. Whenever the work CONTRACTOR, or the expression, Party of the Second Part or Second Party, is used, it shall be understood to mean the person, persons, co-partnership or corporations, to-wit:

_____. who has agreed to perform the work embraced in this contract, or to his or their legal representatives.

3. ENGINEER. Whenever the word ENGINEER is used in this contract, it shall be understood as referring to Melden and Hunt, Inc., Consulting Engineers, ENGINEER of the OWNER, or such other ENGINEER, supervisor or inspector as may be authorized by said OWNER to act in any particular.

4. INTERPRETATION OF PHRASES. Whenever the words "Directed", "Required", "Permitted", "Designated", "Considered", "Necessary", "Prescribed", or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the ENGINEER is intended; and, similarly, the words "Approval", "Acceptable", "Satisfactory", or words of like import shall mean approved by or acceptable or satisfactory to the ENGINEER.

Whenever in the specifications or drawings accompanying this Agreement the terms or descriptions of various qualities relative to finish, workmanship, or other qualities of similar kind which cannot, from their nature, be specifically and clearly described and specified, but are necessarily described in general terms, the fulfillment of which must depend on individual judgment, then in all such cases, any question of the fulfillment of said specifications shall be decided by the ENGINEER, and said work shall be done in accordance with his interpretations of the meaning of the words, terms or clauses defining the character of the work.

5. EXHIBITS. All work shall be done and all materials furnished in strict conformity with the appended advertisement (Notice to Bidders), "Instruction to Bidder", "Proposal", "Specifications", and "Construction Plans", all of which are hereto attached (or considered as if attached and are hereby made a part of this contract.

6. KEEPING OF PLANS AND SPECIFICATIONS ACCESSIBLE. The CONTRACTOR shall be furnished with three (3) copies of all plans, profiles, and specifications without expense to him, and shall keep one copy of the same constantly accessible on the work.

7. RIGHT OF ENTRY. The OWNER reserves the right to enter the property or locations on which the works herein contracted for are to be constructed or installed, by such agent or agents as it may elect, for the purpose of supervising and inspecting the work, or for the purpose of constructing or installing such collateral work as said OWNER may desire.

8. QUANTITIES AND MEASUREMENTS. No extra or customary measurements of any kind will be allowed, but the actual length, area, solid contents, number and weight only shall be considered, unless otherwise specifically provided.

9. LINES AND GRADES. Base lines and grades shall be established by the ENGINEER. Whenever necessary, work shall be suspended to permit of this work, but such suspension will be as brief as practicable and the CONTRACTOR shall be allowed no extra compensation therefore. The CONTRACTOR shall give the ENGINEER ample notice of the time and place where lines and grades will be needed. All stakes, marks, etc., shall be carefully preserved by the CONTRACTOR, and in case of careless destruction or removal by him or his employees, such stakes, marks, etc., shall be replaced by the ENGINEER at the CONTRACTOR'S expense.

10. SUPERINTENDENCE AND INSPECTION. It is agreed by the CONTRACTOR that the OWNER shall be and is hereby authorized to appoint from time to time such ENGINEERS, supervisors, or inspectors as the said OWNER may deem proper, to inspect the material furnished and the work done under this Agreement, and to see that the said material is furnished, and said work is done in accordance with the specifications therefore. The CONTRACTOR shall furnish all reasonable aid and assistance required by the ENGINEER, supervisors and inspectors for the proper inspection and examination of the work and all parts of the same. The CONTRACTOR shall regard and obey the directions and instructions of any ENGINEERS, supervisors or inspectors so appointed, when the same are consistent with the obligations of this Agreement and the accompanying specifications, provided, however, should the CONTRACTOR object to any order by any subordinate engineer, supervisor or inspector, the CONTRACTOR may within six (6) days make written appeal to the ENGINEER for his decision.

Neither Owner nor Engineer shall be liable for their failure to inspect the materials furnished or the work or failure to discover any defective materials or work. Contractor shall be solely liable for defects and failures.

11. DISCREPANCIES AND OMISSIONS. It is further agreed that it is the intent of this contract that all work must be done and all material must be furnished in accordance with the generally accepted practice, and in the event of any discrepancies between the plans and specifications, or otherwise, or in the event of any doubt as to the meaning and intent of any portion of the contract, specifications or plans, the ENGINEER shall define which is intended to apply to the work.

12. COLLATERAL CONTRACTS. The OWNER agrees to provide by separate rate contract or otherwise all labor and material essential to the completion of the work that is not included in this contract, in such manner as not to delay its progress or damage said CONTRACTOR.

13. DAMAGES. Except for the failure to inspect or discover defects in materials furnished or work done, in the event the CONTRACTOR is damaged in the course of the completion of the work by the neglect, omission, mistake or default of the OWNER, or of any other contractor employed by the OWNER upon the work, thereby causing loss to the CONTRACTOR, the OWNER agrees that he will reimburse the CONTRACTOR for such loss. In the event the OWNER is damaged in the course of the work by the act, negligence, omission, mistake or default of the CONTRACTOR, or work being done by others on the job, so as to cause loss for which the OWNER becomes liable, then the CONTRACTOR shall reimburse the OWNER for such loss.

14. LOSSES FROM NATURAL CAUSES. All losses or damage arising out of the nature of the work to be done, or from the action of the elements, or from any unforeseen circumstances in the prosecution of the same, or from unusual obstructions or difficulties which may be encountered in the prosecution of the work shall be sustained and borne by the CONTRACTOR at his own cost and expense.

15. ESTIMATED QUANTITIES. This Agreement, including the specifications, plans and estimate, is intended to show clearly all work to be done and material to be furnished hereunder. The estimated quantities of the various classes of work to be done and material to be furnished under this contract are approximate and are to be used only as a basis for estimating the probable cost of the work and for comparing the proposals offered for the work. It is understood and agreed that the actual amount of the work to be done and the material to be furnished under this contract may differ somewhat from these estimates, and that the basis for payment under this contract shall be the actual amount of such work done and the material furnished.

The CONTRACTOR agrees that he will make no claims for damages, anticipated profits or otherwise on account of any differences which may be found between the quantities of work actually done, the material actually furnished under this contract and the estimated quantities contemplated and contained in the proposal, provided, however, that in case the actual quantity of any item should become as much as 25% more than, or 25% less

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than, estimated or contemplated quantity for such items, then either party to this Agreement upon demand, shall be entitled to a revised consideration upon the portion of the work above or below 25% of the estimated quantities; such revised consideration to be determined by agreement between the parties, otherwise by the terms of this Agreement, as provided under EXTRA WORK.

16. CHANGES AND ALTERATIONS. The CONTRACTOR further agrees that the OWNER may make such changes and alterations as the OWNER may see fit, in the line, grade, form, dimensions, plans or materials for the work herein contemplated, or any part thereof, either before or after the beginning of the construction, without affecting the validity of this contract and the accompanying bonds.

If such changes or alterations diminish the quantity of the work to be done, they shall not constitute the basis of a claim for damages, or anticipated profits on the work that may be dispensed with. If they increase the amount of work, and the increased work can fairly be classified under the specifications, such increase shall be paid for according to the quantity actually done and at the unit price established for such work under this contract; otherwise such additional work shall be paid for as provided under EXTRA WORK. In case the OWNER shall make such changes or alterations as shall make useless any work already done or material already furnished or used in said work, then the OWNER shall recompense the CONTRACTOR for any material or labor so used, and for any actual loss occasioned by such change, due to actual expenses incurred in preparation for the work as originally planned.

17. EXTRA WORK. The term "Extra Work" as used in this contract shall be understood to mean and include all work that may be required by the ENGINEER or OWNER to be done by the CONTRACTOR to accomplish any change, alteration or addition to the work shown upon the plans, or reasonably implied by the specifications, and not covered by the CONTRACTOR'S Proposal, except as provided under Changes and Alterations in Paragraph 16 herein above.

It is agreed that the CONTRACTOR shall perform all Extra Work under the direction of the ENGINEER when presented with a Written Work Order signed by the ENGINEER; subject, however, to the right of the CONTRACTOR to require a written confirmation of such Extra Work Order by the Owner. It is also agreed that the compensation to be paid the CONTRACTOR for performing said EXTRA WORK shall be determined by one or more of the following methods:

Method (A) - By agreed unit prices; or

Method (B) - By agreed lump sum; or

Method (C) - If neither Method (A) nor Method (B) be agreed upon before the Extra Work is commenced, then the CONTRACTOR shall be paid the "actual field cost" of the work plus fifteen (15%) percent.

In the event said Extra Work be performed and paid for under Method (C), then the provisions of this paragraph shall apply and the "actual field cost" is hereby defined to include the cost of all workmen, such as foremen, timekeepers, mechanics and laborers, and materials, supplies, teams, trucks, rentals on machinery and equipment, for the time actually employed or used on such Extra Work, plus actual transportation charges necessarily incurred, if the kind of equipment or machinery be not already on the job, together with all power, fuel, lubricants, water and similar operating expenses, also all necessary incidental expenses incurred directly on account of such Extra Work, including Social Security, Old Age Benefits and other payroll taxes, and a rateable proportion of premiums on Construction and Maintenance Bonds, Public Liability and Property Damage and Workmen's Compensation, and all other insurance as may be required by any law or ordinance, or directed by the ENGINEER or OWNER, or by them agreed to. The ENGINEER may direct the form in which accounts of the "actual field cost" shall be kept and may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment to be used, otherwise these matters shall be determined by the CONTRACTOR. Unless otherwise agreed upon, the prices for the use of machinery and equipment shall be determined by using 100 percentage of the latest schedule of Equipment Ownership Expense adopted by the Associated General Contractors of America. Where practicable the terms and prices for the use of machinery and equipment shall be incorporated in the Written Extra Work Order. The fifteen (15%) percent of the "actual field cost" to be paid the CONTRACTOR shall cover and compensate him for his profit, overhead, general superintendence and field office expense, and all other elements of cost and expense not embraced within the "actual field cost" as herein defined, save that where the CONTRACTOR'S Camp or Field Office must be maintained primarily on account of such Extra Work, then the cost to maintain and operate the same shall be included in the "actual field cost".

No claim for Extra Work of any kind will be allowed unless ordered in writing by the ENGINEER. In case any orders or instructions, either oral or written, appear to the CONTRACTOR to involve Extra Work for which he should receive compensation, he shall make written request to the ENGINEER for written order authorizing such Extra Work. Should a difference of opinion arise as to what does or does not constitute Extra Work, or as to the payment therefore, and the ENGINEER insists upon its performance, the CONTRACTOR shall proceed with the work after making written request for written order and shall keep an accurate account of the "actual field cost" thereof, as provided under Method (C). The CONTRACTOR will thereby preserve the right to submit the matter of payment to arbitration, as herein below provided.

18. PRELIMINARY APPROVAL. No ENGINEER, supervisor or inspector shall have any power to waive the obligations of this contract for the furnishing by the CONTRACTOR of good material, and of his performing good work as herein described, and in full accordance with the plans and specifications. No failure or omission of any ENGINEER, supervisor or inspector to condemn any defective work or material shall release the CONTRACTOR from the obligations to at once tear out, remove and properly replace the same at any time prior to final acceptance upon the discovery of said defective work, or material provided, however, that the ENGINEER, his assistant or inspector, shall, upon request of the CONTRACTOR, inspect and accept or reject any material furnished, and in event the material has been once accepted by the ENGINEER, his assistant or inspector, such acceptance shall be binding on the OWNER, unless it can be clearly shown that such material furnished does not meet the specifications for this work.

Any questioned work may be ordered taken up or removed for re-examination, by the ENGINEER, prior to final acceptance, and if found not in accordance with the specifications for said work, all expense of removing, re-examination, and replacement shall be borne by the CONTRACTOR; otherwise, the expense thus incurred shall be allowed as EXTRA WORK, and shall be paid for by the OWNER.

19. DEFECTS AND THEIR REMEDIES. It is further agreed that if the work or any part thereof, or any material brought on the ground for use in the work or selected for the same shall be deemed by the ENGINEER, as unsuitable or not in conformity with the specifications, the CONTRACTOR shall, after receipt of written notice thereof from the ENGINEER, forthwith remove such materials and rebuild or otherwise remedy such work so that it will be in full accordance with this contract.

20. TIME AND ORDER OF COMPLETION. It is the meaning and intent of this contract, unless otherwise herein specifically provided, that the CONTRACTOR shall be allowed to prosecute his work at such time and seasons, in such order of precedence, and in such manner as shall be most conducive to economy of construction; provided, however, that the order and time of prosecution shall be such that the work shall be substantially completed as a whole and in part, in accordance with this contract, plans and specifications and within the time of completion hereafter designated; provided, also, that when the OWNER is having other work done, either by contract or by his own force, the ENGINEER may direct the time and manner of constructing the work done under this contract, so that conflict will be avoided and the construction of the various works being done for the OWNER shall be harmonized.

The CONTRACTOR further agrees that he will commence work within ten (10) days after the date written notice to do so shall have been given to the CONTRACTOR, and will progress therewith so that the work shall be substantially completed in accordance with the terms of this Agreement.

Contract time may be written in three (3) different ways:

1. A "calendar day" is defined as a calendar day, INCLUDING SUNDAYS, OR ANY LEGAL HOLIDAY, in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of the work for a continuous period of not less than seven (7) hours between 7:00 A.M. and 6:00 P.M.
2. A "working day" is defined as a calendar day, NOT INCLUDING SUNDAYS, OR ANY LEGAL HOLIDAY, in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of the work for a continuous period of not less than seven (7) hours between 7:00 A.M. and 6:00 P.M.
3. A "specific date" is defined as an agreed upon date between the OWNER and the CONTRACTOR, in which weather or other conditions, not under the control of the CONTRACTOR, will permit construction of the principal units of the work for a continuous period of not less than seven (7) hours between 7:00 A.M. and 6:00 P.M.

By the term "substantially completed" is meant that the structure has been suitable for use or occupancy and is in condition to serve its intended purpose, but still may require minor miscellaneous work and adjustment.

21. EXTENSION OF TIME. Should the CONTRACTOR be delayed in the completion of the work by any act or neglect of the OWNER or ENGINEER, or of any employee of either or by other Contractors employed by the OWNER, or by changes ordered in the work, or by strikes, lockouts, fire, and unusual delays by common carriers, and unavoidable cause or causes beyond the CONTRACTOR'S control, or by any cause which the ENGINEER shall decide justifies the delay, then an extension of time shall be allowed for completing the work, sufficient to compensate for the delay, the amount of the extension to be determined by the ENGINEER; provided, however, that the CONTRACTOR shall give the ENGINEER prompt notice in writing of the cause of such delay.

22. HINDRANCES AND DELAYS. No charge shall be made by the CONTRACTOR for hindrances or delays from any cause (except where the work is stopped by order of the OWNER) during the progress of any portion of the work embraced in this contract. In case said work shall be stopped by the act of the OWNER, then such expense as in the judgment of the ENGINEER is caused by such stopping of said work shall be paid by the OWNER to the CONTRACTOR.

23. PRICE FOR WORK. In consideration of the furnishing of all the necessary labor, equipment and material, and the completion of all work by the CONTRACTOR, and on the completion of all work and the delivery of all material embraced in this contract in full conformity with the specifications and stipulations herein contained, the OWNER agrees to pay the CONTRACTOR the prices set forth in the PROPOSAL hereto attached, which has been made a part of this contract. And the CONTRACTOR hereby agrees to receive such prices in full for furnishing all material and all labor required for the aforesaid work, also for all expense incurred by him and for well and truly performing the same and the whole thereof in the manner and according to this Agreement, the attached specifications and requirements of the ENGINEER.

24. PARTIAL PAYMENTS. Once a month the CONTRACTOR shall prepare a statement showing as completely as practicable the total value of the work done by the CONTRACTOR up to and including the last day of the preceeding month; said statement shall also include the value of all sound materials delivered on the ground that are to be fabricated into the work. Statement shall be submitted to ENGINEER for his approval.

The OWNER shall then pay the CONTRACTOR within 15 days of engineer's approval, the total amount of the statement as approved by the ENGINEER, less ten (10%) percent of the amount thereof, which ten (10%) percent shall be retained until final payment, and further less all previous payments, and further less all further sums that may be retained by the OWNER under the terms of this Agreement. It is understood, however, that in case the whole work is near to completion and some unexpected and unusual delay occurs due to no fault or neglect on the part of the CONTRACTOR, the OWNER may --- upon written recommendation of the ENGINEER---pay a reasonable and equitable portion of the retained percentage to the CONTRACTOR; or the CONTRACTOR at the OWNER'S option, may be relieved of the obligation to fully complete the work and, thereupon, the CONTRACTOR shall receive payment of the balance due him under the contract subject only to the conditions stated in paragraph 26 hereof.

25. FINAL COMPLETION AND ACCEPTANCE. Within ten (10) days after the CONTRACTOR has given the ENGINEER written notice that the work has been completed, or substantially completed, the ENGINEER and the OWNER shall inspect the work and within said time, if the work be found to be completed or substantially completed in accordance with the Plans and Specifications, the ENGINEER shall issue to the OWNER and the CONTRACTOR his Certificate of Completion, and thereupon it shall be the duty of the OWNER within said ten (10) days to issue a Certificate of Acceptance of the work to the CONTRACTOR.

26. FINAL PAYMENT. Upon the issuance of the Certificate of Completion, the ENGINEER shall proceed to make final measurements and prepare final statement of the value of all work performed and materials furnished under the terms of the Agreement and shall certify same to the OWNER, who shall pay to the CONTRACTOR on or before

the 15th day after the date of the Certificate of Completion the balance due the CONTRACTOR under the terms of this Agreement, provided he has fully performed his contractual obligations under the terms of this contract; the said payment shall become due in any event upon said performance by the CONTRACTOR.

27. DELAYED PAYMENTS. Should the OWNER fail to make payment to the CONTRACTOR of the sum named in any partial or final statement, when payment is due, then the OWNER shall pay to the CONTRACTOR, in addition to the sum shown as due by such statement, interest thereon at the rate of six (6%) percent per annum from date due as provided in Paragraphs 24 and 26, until fully paid, which shall fully liquidate any injury to the CONTRACTOR growing out of such delay in payment, but the right is expressly reserved to the CONTRACTOR in the event payments be not promptly made, as provided in Paragraph 24, to at any time thereafter treat the contract as abandoned by the OWNER and recover compensation, as provided by Paragraph 45 of this contract.

28. ENGINEER'S AUTHORITY AND DUTY. It is mutually agreed between the parties of this Agreement that the ENGINEER shall supervise all work included herein. In order to prevent delays and disputes and to discourage litigation, it is further agreed by and between the parties of this contract, that if it cannot be otherwise agreed, the ENGINEER shall in all cases determine the amounts and quantities of the several kinds of work, which are to be paid for under this contract, and he shall determine all questions in relation to said work, and the construction thereof, and he shall in all cases decide every question which may arise relative to the execution of this contract on the part of said CONTRACTOR, that his estimates and findings shall be the conditions precedent to the right of the parties hereto to arbitration or to any action on the contract, and to any rights of the CONTRACTOR to receive any money under this contract; provided, however, that should the ENGINEER render any decision or give any direction, which in the opinion of either party hereto, is not in accordance with the meaning and intent of this contract, either party may file with said ENGINEER within thirty (30) days his written objection to the decision or direction so rendered, and by such action may reserve the right to submit the question so raised to arbitration as herein provided. It being the intent of this Agreement that there shall be no delay in the executing of the work, and the decision or directions of the ENGINEER as rendered, shall be promptly carried out, and any claim arising therefrom shall be thereafter adjusted by arbitration as hereinafter provided.

The ENGINEER shall, within a reasonable time, render and deliver to both the OWNER and the CONTRACTOR a written decision on all claims of the parties hereto and on all questions which may arise relative to the execution of the work or the interpretation of the contract, specifications and plans. Should the Engineer fail to make such decision within a reasonable time, an appeal to arbitration may be taken as if his decision has been rendered against the party appealing.

29. CONTRACTOR'S DUTY. The CONTRACTOR shall give personal attention to the faithful prosecution and completion of this work and shall be present either in person or by duty authorized representative on the site of the work continually during its progress. He shall maintain an office on or adjacent to the site of the work if so requested by the ENGINEER.

30. CONTRACTOR'S AGENT. The CONTRACTOR during his absence from the work shall keep a competent superintendent or foreman upon the work fully authorized to act for him in his absence, and to receive such orders as may be given for the proper continuance of the work. Notice to do any work, to alter work, to cease work which the CONTRACTOR is obligated to do; or concerning any imperfections in work or any material furnished when given to any foreman or agent of the CONTRACTOR in charge of any operation of the work in the absence of the CONTRACTOR shall be considered as notice to the CONTRACTOR, provided any notice given under this paragraph shall be in writing.

31. CHARACTER OF WORKMEN. The CONTRACTOR agrees to employ only orderly, competent and skillful men to do the work, and that whenever the ENGINEER shall inform him in writing that any man or men on the work are, in his opinion, incompetent, unfaithful or disorderly, such man or men shall be discharged from the work and shall not again be employed on the same without the ENGINEER'S written consent.

32. CONSTRUCTION PLANT. The CONTRACTOR shall provide all labor, tools, equipment, machinery and material necessary in the prosecution and completion of this contract where it is not otherwise specifically provided that the OWNER will furnish the same, and it is also understood that the OWNER shall not be held responsible for the care, preservation, conservation, or protection of any material, tools, or machinery or any part of the work until it is finally completed and accepted.

33. RIGHT OF ENGINEER TO MODIFY METHODS AND EQUIPMENT. If at any time the methods or equipment used by the CONTRACTOR are found to be inadequate to secure the quality of work or the rate of progress required under this contract, the ENGINEER may order the CONTRACTOR in writing to increase their safety or improve their character and efficiency, and the CONTRACTOR shall comply with such order.

If at any time the working force of the CONTRACTOR is inadequate for securing the progress herein specified, the CONTRACTOR shall, if so ordered in writing increase his force or equipment, or both, to such an extent as to give reasonable assurance of compliance with the schedule of progress.

34. SANITATION. 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 manner and at such points as shall be approved by the ENGINEER, and their use shall be strictly enforced.

35. CONTRACTOR'S BUILDINGS. The building of structures for housing men, or the erection of tents or other forms of protection, will be permitted only at such places as the ENGINEER shall direct, and the sanitary conditions of the grounds in or about such structures shall at all times be maintained in a manner satisfactory to the ENGINEER.

36. PROTECTION AGAINST ACCIDENT TO EMPLOYEES AND THE PUBLIC. The CONTRACTOR shall maintain such insurance as will protect the CONTRACTOR, the OWNER, and the ENGINEER from claims under Workmen's Compensation Acts, and any amendments thereof, and from any other claims for damages from personal injury, including death, which may arise from operations under this Agreement, whether such operations be by himself or by any subcontractor, or anyone directly or indirectly employed by either of them. Certificate of such insurance shall be filed with the OWNER, if so required, and shall be subject to his approval for adequacy of protection.

36a. PUBLIC LIABILITY AND PROPERTY DAMAGE. The CONTRACTOR shall maintain such insurance as will protect him and the OWNER against any and all claims and demands arising from injury to person or persons not in the employ of the CONTRACTOR, and against any and all claims and demands resulting from damage to any property due to any act or omission the CONTRACTOR or OWNER may be liable, in the operation of the work or the execution of this contract. Such insurance shall remain in effect on portions of the work which have been completed and which may or may not be occupied or utilized by the OWNER, if so required, and shall be subject to his approval for adequacy of protection.

37. PROTECTION OF ADJOINING PROPERTY. The said CONTRACTOR shall take proper means to protect the adjacent or adjoining property or properties in any way encountered, or which might be injured or seriously affected by any process of construction, to be undertaken under this Agreement, from any damage or injury be reason of said process of construction; and he shall be liable for any and all claims for such damage on account of his failure to fully protect all adjoining property.

38. PROTECTION AGAINST CLAIMS OR SUB-CONTRACTORS, LABORERS, MATERIALMEN AND FURNISHERS OF MACHINERY, EQUIPMENT AND SUPPLIES. The CONTRACTOR agrees that he will indemnify and save the OWNER harmless from all claims growing out of the lawful demands of

sub-contractors, laborers, workmen, mechanics, materialmen and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. When so desired by the OWNER, the CONTRACTOR shall furnish satisfactory evidence that all obligations of the nature here in above designated have been paid, discharged or waived. If the CONTRACTOR fails so to do, then the OWNER may at the option of the CONTRACTOR either pay unpaid bills, of which the OWNER has written notice, direct or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to liquidate any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payments to the CONTRACTOR shall be resumed in full, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligation upon the OWNER by either the CONTRACTOR or his SURETY.

39. PROTECTION AGAINST ROYALTIES OR PATENTED INVENTION. The CONTRACTOR shall protect and save harmless the OWNER from all and every demand for damages, royalties or fees on any patented invention used by him in connection with the work done or material furnished under this contract; provided, however, that if any patented materials, machinery, appliance or invention is clearly specified in this contract, then, and in that event, the cost of procuring the rights of use and the legal release or indemnity shall be borne and paid by the OWNER direct, unless such cost is determined and directed to be included in the bid price at the time the proposal is submitted.

40. LAWS AND ORDINANCES. The CONTRACTOR shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations, which in any manner affect the contract or the work, and shall indemnify and save harmless the OWNER against any claim arising from the violation of any such laws and ordinances, whether by the CONTRACTOR or his employees. In case the OWNER is a body politic and corporate, the law from which it derives its powers, insofar as the same regulates the objects for which, or the manner in which, or the conditions under which, the OWNER may enter into contract, shall be controlling, and shall be considered as part of this Contract, to the same effect as though embodied herein.

41. LIQUIDATED DAMAGES FOR DELAY. And the CONTRACTOR agrees that time is the essence of this contract, and that for each day of delay beyond the number of calendar or working days (whichever the contract is written) herein agreed upon for the completion of the work herein specified and contracted for (after due allowance for such extension of time as is provided

for under Extension of Time herein above the OWNER may withhold permanently from the CONTRACTOR'S total compensation, the sum of two hundred fifty dollars per day Dollars (\$250.00/day) as stipulated damages for such delay.

42. RECIPROCAL REWARD FOR DELAYED OR EARLY COMPLETION -----

DELETED

43. ASSIGNMENT AND SUBLETTING. The CONTRACTOR further agrees that he will retain personal control and will give his personal attention to the fulfillment of this contract and that he will not assign by Power of Attorney, or otherwise, nor sublet said contract without the written consent of the OWNER, and that no part or feature of the work will be sublet to anyone objectionable to the ENGINEER or the OWNER. The CONTRACTOR further agrees that the subletting of any portion or feature of the work, or materials required in the performance of this contract, shall not relieve the CONTRACTOR from his full obligations to the OWNER, as provided by this Agreement.

44. ABANDONMENT BY CONTRACTOR. In case the CONTRACTOR should abandon and fail or refuse to resume work within ten (10) days after written notification from the OWNER, or the ENGINEER, or if the CONTRACTOR fails to comply with the orders of the ENGINEER, when such orders are consistent with his contract, or with this Agreement or with the Specifications hereto attached, then, and in that case, the Surety of the bond shall be notified in writing and directed to complete the work, and a copy of said notice shall be delivered to the CONTRACTOR.

After receiving said notice of abandonment the CONTRACTOR shall not remove from the work any machinery, equipment, tools, materials or supplies then on the job, but the same, together with any materials and equipment under contract for the work, may be held for use on the work by the OWNER or the SURETY on the construction bond, or another contractor, in completion of the work; and the CONTRACTOR shall not receive any rental or credit therefore, (except when used in connection with Extra Work), where credit shall be allowed as provided for under Paragraph 17, Extra Work); it being understood that the use of such equipment and materials will ultimately reduce the cost to complete the work and be reflected in the final statement.

In case the Surety should fail to commence compliance with the notice for completion herein before provided for, within ten (10) days after service of such notice, then the OWNER may provide for completion of the work in either of the following election manners:

(a) The OWNER may thereupon employ such force of men and use such machinery, equipment, tools, materials, and supplies as said OWNER may deem necessary to complete the work and charge the expense of such labor, machinery, equipment, tools, materials and supplies to said CONTRACTOR, and the expense so charged shall be deducted and paid by the OWNER out of such monies as may be due, or that may thereafter at any time become due to the CONTRACTOR under and by virtue of this Agreement. In case such expense is less than the sum which would have been payable under this contract, if the same had been completed by the CONTRACTOR, then said CONTRACTOR shall receive the difference. In case such expense is greater than the sum which would have been payable under this contract, if the same had been completed by said CONTRACTOR, then the CONTRACTOR and/or his SURETY shall pay the amount of such excess to the OWNER; or

(b) The OWNER under sealed bids, after five (5) days notice published one or more times in a newspaper having a general circulation in the county of the location of the work, may let the contract for the completion of the work under substantially the same terms and conditions which are provided in this contract. In case of any increase in cost to the OWNER under the new contract as compared to what would have been the cost under this contract such increase shall be charged to the CONTRACTOR and the SURETY shall be and remain bound therefore. However, should the cost to complete any such new contract prove to be less than what would have been the cost to complete under this contract, the CONTRACTOR and/or his SURETY shall be credited therewith.

When the work shall have been substantially completed the CONTRACTOR and his SURETY shall be so notified and Certificates of Completion and Acceptance, as provided in Paragraph 25 hereinabove shall be issued. A complete itemized statement of

the contract accounts, certified to by the ENGINEER as being correct, shall then be prepared and delivered to the CONTRACTOR and his SURETY, whereupon the CONTRACTOR and/or his SURETY, or the OWNER as the case may be, shall pay the balance due as reflected by said statement, within fifteen (15) days after the date of such Certificate of Completion.

In the event the statement of accounts shows that the cost to complete the work is less than that which would have been the cost to the OWNER had the work been completed by the CONTRACTOR under the terms of this contract; or when the CONTRACTOR and/or his SURETY shall pay the balance shown to be due by them to the OWNER, then all machinery, equipment, tools, materials or supplies left on the site of the work shall be turned over to the CONTRACTOR and/or his SURETY. Should the cost to complete the work exceed the contract price, and the CONTRACTOR and/or his SURETY fail to pay the amount due the OWNER within the time designated hereinabove, and there remains any machinery, equipment, tools, materials or supplies on the site of the work, notice hereof, together with an itemized list of such equipment and materials shall be mailed to the CONTRACTOR and his SURETY at the respective addresses designated in this contract; provided, however, that actual written notice given in any manner will satisfy this condition. After mailing or other giving of such notice, such property shall be held at the risk of the CONTRACTOR and his SURETY subject only to the duty of the OWNER to exercise ordinary care to protect such property. After fifteen (15) days from the date of said notice the OWNER may sell such machinery, equipment, tools, materials or supplies and apply the net sum derived from such sale to the credit of the CONTRACTOR and his SURETY. Such sale may be made at either public or private sale, with or without notice, as the OWNER may elect. The OWNER shall release any machinery, equipment, tools, materials, or supplies, which remain on the work, and belong to persons other than the CONTRACTOR or his SURETY, to their proper owners.

45. ABANDONMENT BY OWNER. In case the OWNER shall fail to comply with the terms of this contract, and should fail or refuse to comply with said terms within ten (10) days after written notification by the CONTRACTOR, then the CONTRACTOR may suspend or wholly abandon the work, and may remove therefrom all machinery, tools and equipment, and all materials on the ground that have not been included in payments to the CONTRACTOR and have not been brought into the work. And thereupon the ENGINEER shall make an estimate of the total amount earned by the CONTRACTOR, which estimate shall include the value of all work actually completed by said CONTRACTOR at the prices stated in the attached proposal, the value of all partially completed work at a fair and equitable price, and the amount of all Extra Work performed at the prices agreed upon, or provided for by the terms

of this contract, and a reasonable sum to cover the cost of any provisions made by the CONTRACTOR to carry the whole work to completion and which cannot be utilized. The ENGINEER shall then make a final statement of the balance due the CONTRACTOR by deducting from the above estimate all previous payments by the OWNER and all other sums that may be retained by the OWNER who shall pay to the CONTRACTOR on or before thirty (30) days after the date of the notification by the CONTRACTOR the balance shown by said final statement as due the CONTRACTOR, under the terms of this Agreement.

46. BOND. IT is further agreed by the parties to this contract that the CONTRACTOR will execute a bond in an amount equal to one hundred (100%) percent of the contract price for the satisfactory performance of the work in accordance with this contract in the form provided for this purpose, and it is agreed that this contract shall not be in effect until such bond is furnished and approved by the OWNER.

47. TIME OF FILING CLAIMS. It is further agreed by both parties hereto that all questions of dispute or adjustment presented by the CONTRACTOR shall be in writing and filed with the ENGINEER within a reasonable time after the ENGINEER has given any directions, order or instruction to which the CONTRACTOR desires to take exception. The ENGINEER shall reply to such written exceptions by the CONTRACTOR and render his final decision, any demand for arbitration shall be filed with the ENGINEER and the OWNER in writing within ten (10) days after the date of the ENGINEER'S final decision. It is further agreed that final acceptance of the work by the OWNER and the acceptance by the CONTRACTOR of the final payment shall be a bar to any claims by either party, except as follows:

Contractor guarantees all workmanship, materials, and equipment, furnished under this contract, against defect or failure for a period of 12 months following date of final acceptance.

48. ADEQUACY OF DESIGN. It is understood that the OWNER has selected the ENGINEER named in this Agreement to prepare the plans and specifications, and all Supplements thereto; and agreed that the ENGINEER will be responsible for the adequacy of the design, sufficiency of the plans and specifications, and the safety of the structure, provided the CONTRACTOR has complied with said plans and specifications, all modifications thereof, and additions and alterations thereof, approved by the ENGINEER. The burden of proof shall be upon the CONTRACTOR to show that he has complied with this contract, said plans, specifications, and all modifications thereof, and all additions and alterations thereto.

49. ARBITRATION. All questions of dispute under this Agreement shall be submitted to arbitration at the request of either party to the dispute. The parties may agree upon one arbiter, otherwise, there shall be three; one named in writing by each party, and the third chosen by the two arbiters so selected; or if the arbiters fail to select a third within ten (10) days, he shall be chosen by the ENGINEER. Should the party demanding arbitration fail to name an arbiter within ten (10) days of the demand, his right to arbitrate shall lapse, and the decision of the ENGINEER shall be final and binding on him. Should the other party fail to choose an arbiter within ten (10) days, the ENGINEER shall appoint such arbiter. Should either party refuse or neglect to supply the arbiters with any papers or information demanded in writing, the arbiters are empowered by both parties to take ex-parte proceedings.

The arbiters shall act with promptness. The decision of any two shall be binding on both parties to the contract. THE DECISION OF THE ARBITERS UPON ANY QUESTION SUBMITTED TO ARBITRATION UNDER THIS CONTRACT WILL BE A CONDITION PRECEDENT TO ANY RIGHT OF LEGAL ACTION. The decision of the arbiter or arbiters may be filed in court to carry it into effect.

The arbiters, if they deem the case demands it, are authorized to award the party whose contention is sustained, such sums as they deem proper for the time, expense and trouble incident to the appeal, and if the appeal was taken without reasonable cause, they may award damages for any delay occasioned thereby. The arbiters shall fix their own compensation, unless otherwise provided by agreement, and shall assess the cost and charges of the arbitration upon either or both parties. The award of the arbiters must be made in writing, and shall not be open to objection on account of the form of proceedings or award.

50. INDEMNIFICATION. To the fullest extent permitted by law, the Contractor shall waive any right of contribution and shall indemnify and hold harmless the Owner and the Engineer and their agents and employees and consultants from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from or in connection with the performance of the Work, provided that any such claim, damage, loss or expense is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in the Agreement.

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The Indemnity by the Contractor in favor of Owner and Engineer shall extend to (1) all attorneys fees and costs incurred in bringing an action to enforce the provisions of this indemnity or any other indemnity contained in the General Conditions; and (2) time expended by the party being indemnified and their employees, at their usual rates plus costs of travel, long distance telephone and reproduction of documents.

GENERAL PREVAILING WAGE LEGAL REQUIREMENTS

The Contractor's attention is called to Articles 5159A and 5160 of the Revised Civil Statutes of Texas, which Statutes must be complied with. These articles are as follows:

Article 5159A:

Section 1. Not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed, and not less than the general prevailing rate of per diem wages for legal holiday and overtime work, shall be paid to all laborers, workmen and mechanics employed by or on behalf of the State of Texas, or by or on behalf of any county, city and county, city, town, district, or other political subdivision of the State, engaged in the construction of public works, exclusive of maintenance work. Laborers, workmen, and mechanics employed by contractors or subcontractors in the execution of any contract or contracts for public works with the State, or any officer or public body thereof, or in the execution of any contract or contracts for public works, with any county, city and county, city, town, district or other political subdivision of this State, or any officer or public body thereof, shall be deemed to be employed upon public works.

Section 2. The public body awarding any contract for public work on behalf of the State, or on behalf of any county, city and county, city, town, district or other political subdivision thereof, or otherwise undertaking any public work, shall ascertain the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft or type of workman or mechanic needed to execute the contract, and shall specify in the call for bids for said contract, and in the contract itself, what the general prevailing rate of per diem wages in the said locality is for each craft or type of workman needed to execute the contract, also the prevailing rate of legal holiday and overtime work, and it shall be mandatory upon the contractor to whom the contract is awarded, and upon any subcontractor under him, to pay not less than the said specified rates to all laborers, workmen and mechanics employed by them in the execution of the contract. The contractor shall forfeit as a penalty to the state, county, city and county, city, town, district or other political subdivision on whose behalf the contract is made or awarded, Ten Dollars (\$10.00) for each laborer, workman or mechanic employed, for each calendar day, or portion thereof, such laborer, workman or mechanic is paid less than the said stipulated rates for any work done under said contract, by him,

or by any subcontractor under him, and the public body awarding the contract shall cause to be inserted in the contract a stipulation to this effect. It shall be the duty of such public body awarding the contract, and its agents and officers to take cognizance of complaints of all violations of the provisions of this Act committed in the course of the execution of the contract, and, when making payments to the contractor of monies becoming due under said contract, to withhold and retain therefrom all sums and amounts which shall have been forfeited pursuant to the herein said stipulation and the terms of this Act; provided, however, that no sum shall be so withheld, retained or forfeited, except from the final payment, without a full investigation by the awarding body. It shall be lawful for any contractor to withhold from any subcontractor under him sufficient sums to cover any penalties withheld, retained or forfeited, except from the final payment, without a full investigation by the awarding body. It shall be lawful for any contractor to withhold from any subcontractor under him sufficient sums to cover any penalties withheld from him by the awarding body on account of the said subcontractor's failure to comply with the terms of this Act, and if payment has already been made to him the contractor may recover from him the amount of the penalty or forfeiture in a suit at law.

Section 3. The contractor and each subcontractor shall keep, or cause to be kept, an accurate record showing the names of occupations of all laborers, workmen and mechanics employed by him, in connection with the said public work, and showing also the actual per diem wages paid to each of such workers, which record shall be open at all reasonable hours to the inspection of the public body awarding the contract, its officers and agents.

Section 4. Any construction or repair work done under contract, and paid for in whole or in part out of public funds, other than work done directly by any public utility company pursuant to order of the Railroad Commission or other public authority, whether or not done under public supervision or direction, or paid for wholly or in part out of the public funds, shall be held to the "public works" within the meaning of this Act. The terms "locality in which the work is performed" shall be held to mean the county, city and county, city, town, district or other political subdivision of this State in which the building, highway, road, excavation or other structure, project, development or improvement is situated in all cases in which the contract is awarded by the State, or any public body thereof, and shall be held to mean the limits of the county, city and county, city, town, district, or other political subdivision on whose behalf the contract is awarded in all other cases. The term "general prevailing rate of per diem wages" shall be the rate determined upon as such rate by the public body awarding the contract, or authorizing the work, whose decision in the matter shall be final. Nothing in this Act, however, shall be construed to prohibit the payment of any laborer, workman, or mechanic

employed on any public work as aforesaid of more than the said general prevailing rate of wages. Acts 1933, 43rd Leg., p. 91, ch. 45.

Section 5. Any officer, agent or representative of the State, or any political subdivision, district or municipality thereof, who willfully shall violate, or omit to comply with any of the provisions of this Act, and any contractor or subcontractor, or agent or representative thereof, doing public work as aforesaid, who shall neglect to keep, or cause to be kept, an accurate record of the name, occupation and actual wages paid to each laborer, workman and mechanic employed by him in connection with the said public work, or who shall refuse to allow access to same at any reasonable hour to any person authorized to inspect same under this Act, shall be guilty of a misdemeanor, and upon conviction, shall be punished by a fine not exceeding Five Hundred Dollars (\$500.00), or by imprisonment not exceeding six (6) months, or by both such fine and imprisonment, in the discretion of the Court.

Section 6. If any section, sentence, clause or part of this Act is for any reason held to be unconstitutional such decision shall not affect the remaining portions of this Act. The Legislature hereby declares that it would have passed this Act, and each section, sentence, clause or part thereof, irrespective of the fact that one or more section, sentences, clauses or parts thereof be declared unconstitutional.

Article 5160:

A. Any person or persons, firm or corporation, hereinafter referred to as "prime contractor", entering into a formal contract in excess of Twenty Five Thousand Dollars (\$25,000) with this State, any department, board or agency thereof; or any county of this state, department, board or agency thereof; or any municipality of this State, department, board or agency thereof; or any school district in this State, common or independent, or subdivision thereof; or any other governmental or quasi-governmental authority, whether specifically named herein or not, authorized under any law of this State, general or local, to enter into contractual agreements for the construction, alteration or repair of any public building or the prosecution or completion of any public work, shall be required before commencing such work to execute to the aforementioned governmental authority or authorities, as the case may be, the statutory bonds as hereinafter prescribed but no governmental authority may require a bond if the contract does not exceed the sum of \$25,000. Each such bond shall be executed by a corporate surety or corporate sureties duly authorized to do business in this state.

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In the case of contracts of the State or a department, board, or agency thereof, the aforesaid bonds shall be payable to the State and shall be approved by the Attorney General as to form.

In

case of all other contracts subject to this Act, the bonds shall be payable to the governmental awarding authority concerned, and shall be approved by it as to form. Any bond furnished by any

prime contractor in an attempted compliance with this Act shall be treated and construed as in conformance with the requirements of this Act as to rights created, limitations thereon, and remedies provided.

(a) A Performance Bond in the amount of the contract conditioned upon the faithful performance of the work in accordance with the plans, specifications and contract documents. Said bond shall be solely for the protection of the State or the governmental authority awarding the contract, as the case may be.

(b) A Payment Bond, in the amount of the contract, solely for the protection of all claimants supplying labor and material as hereinafter defined, in the prosecution of the work provided for in said contract, for the use of each such claimant.

B. Every claimant who has furnished labor or material in the prosecution of the work provided for in such contract in which a Payment Bond is furnished as required hereinabove, and who has not been paid in full therefore, shall have the right, if his claim remains unpaid after the expiration of sixty (60) days after the filing of the claim as herein required, to sue the principal and the surety or sureties on the Payment Bond jointly or severally for the amount due on the balance thereof unpaid at the time of filing the claim or of the institution of the suit; provided.

(a) Notices Required for Unpaid Bills, other than notices solely for Retainages as hereinafter described.

Such claimant shall have given within ninety (90) days after the 10th day of the month next following each month in which the labor was done or performed, in whole or in part, or material was delivered, in whole or in part, for which such claim is made, written notices of the claim by certified or registered mail, addressed to the prime contractor at his last known business address, or at his residence, and to the surety or sureties. Such notices shall be accompanied by a sworn statement of account stating in substance that the amount claimed is just and correct and that all just and lawful offsets, payments, and credits known to the affiant have been allowed. Such statement of account shall include therein the amount of any retainage or retainages applicable to the amount that have not become due by virtue of terms of the contract between the claimant and the prime contractor or between the claimant and a subcontractor. When the claim is based on a written agreement, the claimant shall have the option to enclose with the sworn statement of account, as such notice a true copy of such agreement and advising completion or value of partial completion of same.

(1) When no written contract or written agreement exists between the claimant and the prime contractor or between the claimant and a subcontractor, except as provided in subparagraph B (a) (2) hereof, such notices shall state the name of the party for whom the labor was done or performed or to whom the material was delivered, and the approximate dates of performance and delivery, and describing the labor or materials or both and amount due therefore. The claimant shall generally itemize his claim and shall accompany same with true copies of documents, invoices or orders sufficient to reasonably identify the labor performed or material delivered for which claim is being made. Such documents and copies thereof shall have thereon a reasonable identification or description of the job and destination of delivery.

(2) When the claim is for multiple items of labor or material or both to be paid for on a lump sum basis such notice shall state the name of the party for whom the labor was done or performed or to whom the material was delivered, the amount of the contract and whether written or oral, the amount claimed and the approximate date or dates of performance or delivery or both and describing the labor or materials or both in such a manner so as to reasonably identify the said labor or materials.

(3) When a claimant who is a subcontractor or materialman to the prime contractor or to a subcontractor has written unit price agreement, completed or partially completed, such notices shall be sufficient if such claimant shall attach to his sworn statement of such units completed and of such units partially completed.

(b) Additional Notices Required of Claimants Who Do Have a Direct Contractual Relationship with the Prime Contractor.

Excepting an individual mechanic or laborer who is a claimant for wages, no right of action shall be legally enforceable, nor shall any suit be maintained under any provision of this Act by a claimant not having a direct contractual relationship with any prime contractor for material furnished or labor performed under the provisions of this Act unless such claimant has complied with those of the following additional requirements which are applicable to the claim.

(1) If any agreement exists between the claimant and any subcontractors by which payments are not to be made in full, therefore, in the month next following each month in which the labor was performed or the materials were delivered or both, such claimant shall have given written notice by certified or registered mail addressed to the prime contractor at his last known business address, or at his residence, within thirty-six (36) days after the 10th day of the month next following the commencement of the delivery of materials of the performance of

labor that there has been agreed upon between the claimant and such subcontractors such retention of funds. Such notice shall indicate generally the nature of such retainage.

(2) Such Claimant shall have given written notice by certified or registered mail as described in the preceding subparagraph B (b) (1), to the prime contractor within thirty-six (36) days after the 10th day of the month next following each month in which the labor was done or performed, in whole or in part, or material delivered, in whole or in part, that payment therefore has not been received. A copy of the statement sent to the subcontractor shall suffice as such notice.

(3) If the basis of the claim is an undelivered specially fabricated item or items as described in paragraph C (b) (2), such claimant shall have given written notice by certified or registered mail as described in the preceding subparagraph B (b) (1) to the prime contractor within forty-five (45) days after the receipt and acceptance of an order for hereinafter described specially fabricated material that such an order has been received and accepted.

(c) Notices of Unpaid Retainages Required. Retainage Defined.

Retainage as referred to in this Act is defined as any amount representing any part of the contract payments which are not required to be paid to the claimant within the month next following the month in which the labor was done or material furnished or both.

When a contract between the prime contractor and such claimant, or between a subcontractor and such claimant provided for retainage, such claimant shall have given, on or before ninety (90) days after the final completion of the contract between the prime contractor and the awarding authority, written notices of the claim for such retainage by certified or registered mail to the prime contractor at his last known business address, or at his home address, and to the surety or sureties. Such notices shall consist of a statement showing the amount of the contract, the amount paid, if any, and the balance outstanding. No claim for such retainage contained in such notices shall be valid to an extent greater than the amount specified in the contract between the prime contractor or the subcontractor and the claimant to be retained, and in no event greater than ten percent (10%) of such contract. However, such notices shall not be required if the amount claimed is part of a prior claim which has been made as heretofore described.

C. A claimant is defined as anyone having direct contractual relationship with the Prime Contractor, or with a subcontractor, to perform the work or a part of the work or to furnish labor or materials or both as a part of the work as follows

(a) Labor is to be construed to mean labor used in the direct prosecution of the work.

(b) Material is to be construed to mean any part or all of the following:

(1) Material incorporated in the work, or consumed in the direct prosecution of the work, or ordered and delivered for such incorporation or such consumption.

(2) Material specially fabricated on the order of the Prime Contractor or of a subcontractor for use as a component part of said public building, or other public work so as to be reasonably unsuitable for use elsewhere, even though such material has not been delivered or incorporated into the public building or public work, but in such extent only to the extent of its reasonable costs, less its fair salvage value, and only to the extent that such specially fabricated material is in conformity and compliance with the plans, specifications and contract documents for same.

(3) Rent at a reasonable rate and actual running repairs at a reasonable cost for construction equipment, used in the direct prosecution of the work at the project site, or reasonably required and delivered for such use.

(4) Power, water, fuel and lubricants, when such items have been consumed or ordered and delivered for consumption, in the direct prosecution of the work.

(c) A subcontractor is any person or persons, firm or corporation who has furnished labor or materials or both as defined above to fulfill an obligation to the prime contractor or to a subcontractor to perform and install all or part of the work required by the prime contractor.

A subcontractor shall have a claim, but such claim, including previous payments, however, shall not exceed that proportion of the subcontract price which the work done bears to the total of the work covered by the subcontract.

(d) When a claim is assigned to a third party then and in that event such third party shall stand in the same position as a claimant, provided the notices required in this Act are given.

D. Any person who shall willfully file a false and fraudulent claim hereunder shall be subject to the penalties for false swearing.

E. In the event any contractor, who shall have furnished the bonds provided in this Statute, shall abandon performance of his contract or the awarding authority shall lawfully terminate his right to proceed with performance thereof because of a default or defaults on his part, no further proceeds of the contract shall be payable to him unless and until all costs of completion of the work shall have been paid by him. Any balance remaining shall be payable to him or his surety as their interest may appear, as may be established by agreement or judgment of a court of competent jurisdiction.

F. The contracting authority is authorized and directed to furnish to any person making application therefore who submits an affidavit that he has supplied labor, rented equipment, or materials for such work, or that he has entered into a contract for specially fabricated material, and payment therefore has not been made, or that he is being sued on any such bond, a certified such payment bond and the contract for which it was given, which copy shall be prima facie evidence of the contents, execution and delivery of the original. Applicants shall pay for such certified copies such reasonable fees as the contracting authority may fix to cover the actual cost of preparation thereof.

G. All suits instituted under the provisions of this Act shall be brought in a court of competent jurisdiction in the county in which the project or work, or any part thereof, is situated. No suit shall be instituted on the performance bond after the expiration of one (1) year after the date of final completion of such contract. No suit shall be instituted by a claimant on the payment bond after the expiration of one (1) year after the date suit may be brought thereon under the provisions of Section 1.B. hereof. The State of Texas shall not be liable for the payment of any cost or the expenses of any suit instituted by any party or parties on the payment bond. Acts 1913, p. 185; Acts 1929, 41st Leg., p. 481, ch. 226(,) 1; Acts 1959, 56th Leg., p. 155, ch. 93.(,) 1.

TECHNICAL SPECIFICATIONS

GENERAL CONSTRUCTION AND SPECIFICATIONS

INTENT OF PLANS AND SPECIFICATIONS

The intent of the plans and specifications is to prescribe a complete work or improvements which the Contractor undertakes to do, in full compliance with the plans, specifications, special provisions, proposal and contract. The Contractor shall do all work as provided in the plans, specifications, special provisions, proposal and contract and shall do such additional extra work as may be considered necessary to complete the work in a satisfactory and acceptable manner. The Contractor shall furnish all labor, tools, materials, machinery, equipment and incidentals necessary to the prosecution of the work.

FINAL CLEAN-UP

Upon the completion of the work and before acceptance and final payment will be made, the Contractor shall clean and remove from the site of the work surplus and discarded materials, temporary structures and debris of every kind. He shall leave the site of the work in a neat and orderly condition equal to that which originally existed. Surplus and waste materials removed from the site of the work shall be disposed of at locations satisfactory to the Engineer. Grounds around any structures shall be dressed to final grade as shown on plans.

EXISTING STRUCTURES

The plans show the locations of all known surface and subsurface structures. However, the exact location of gas mains, water mains, conduits, sewers, etc., is unknown and the Owner assumes no responsibility for failure to show any of these structures on the plans or to show them in their exact location. It is mutually agreed such failure will not be considered sufficient basis for claims for additional compensation for extra work or for increasing the pay quantities in any manner whatsoever, unless the obstruction encountered is such as necessitates or requires the building of special work, provision for work is not made in the plans and proposal, in which case the provisions in these specifications for extra work shall apply.

COORDINATION OF PROJECT

The plans, specifications, the proposal, special provisions and all supplementary documents are intended to describe a complete work and are essential parts of the contract. A requirement occurring in any of them is binding. In case of discrepancies, figured dimensions shall govern over specifications; special provisions shall govern over both general and standard specifications; and plans and quantities shown on the plans shall govern over those shown in the proposal. The Contractor shall not take advantage of any apparent error or omission in the plans and specifications and the Engineer shall

be permitted to make such corrections or interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications. In the event the Contractor discovers an apparent error or discrepancy, he shall immediately call this to the attention of the Engineer.

COOPERATION OF THE CONTRACTOR

The Contractor shall give to the work the consistent attention necessary to facilitate the progress thereof, and he shall cooperate with the Engineer, his inspectors, and with other contractors in every way possible.

WAGES

All employees directly employed on the work shall be paid the prevailing wage scale for work of a similar character in this locality. Minimum wage scale is also included in these specifications.

MATERIALS-GENERAL

The materials shall be the best procurable, as required by the plans, specifications and special provisions. The material shall be used only after approval has been given by the Engineer and only so long as the quality of said materials remains equal to the requirements of the specifications. The Contractor shall furnish approved materials from other sources, if for any reason the product from any source at any time before commencement or during the prosecution of the work proves unacceptable. After approval, any materials which has become mixed with or coated with dirt or any other foreign substances during its delivery and handling will not be permitted to be used in the work.

MATERIALS STORAGE

Any and all materials, such as cement, lime, mill work, or other materials or equipment subject to deterioration by exposure to weather or other factors, shall be stored in such a manner to protect them from deterioration or damage preceding the time they become a permanent part of final structures.

"OR EQUAL" CLAUSE

Whenever a material or article is required is specified or shown on the plans by using the name of the proprietary product, or of a particular manufacturer or vendor, any material or article which will perform adequately the duties imposed by the general design and

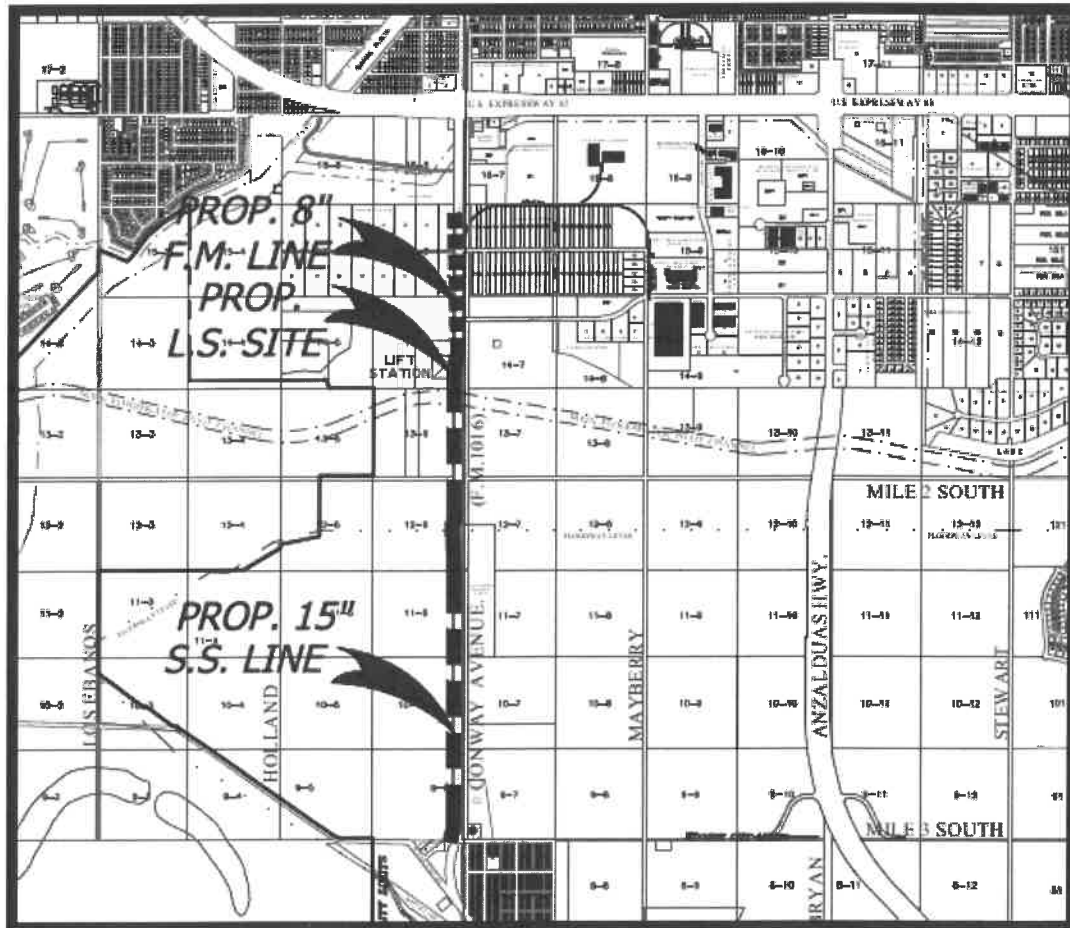
will be considered equal and satisfactory, provided the material or article so proposed is of equal substance and function, and only after written approval by the Engineer.

Except where otherwise specifically prescribed herein, all provisions except for Measurement and Payment of the following Texas State Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, dated June 1, 2004, shall cover the work to be done under the specifications:

Item 100	Preparing ROW
Item 204	Sprinkling
Item 210	Rolling
Item 216	Proof Rolling
Item 247	Flexible Base
Item 251	Reworking Base Courses
Item 260	Lime Treatment (Road-Mixed)
Item 263	Lime Treatment (Plant-Mixed)
Item 300	Asphalts, Oils, & Emulsions
Item 310	Prime Coat
Item 340	Dense-Graded Hot Mix Asphalt (Method)
Item 341	Dense-Graded Hot Mix Asphalt (QC/QA)
Item 400	Excavation and Backfill for Structures
Item 404	Driving Pile
Item 409	Prestressed Concrete Piling
Item 420	Concrete Structures
Item 421	Hydraulic Cement Concrete
Item 425	Precast Prestressed Concrete Structural Members

Item 426	Prestressing
Item 428	Concrete Surface Treatment
Item 440	Reinforcing Steel
Item 450	Railing
Item 502	Barricades, Signs, and Traffic Handling
Item 506	Temporary Erosion, Sedimentation, and Environmental Controls
Item 529	Concrete Curb, Gutter, and Combined Curb and Gutter
Item 530	Intersections, Driveways, and Turnouts

Technical Specifications
For
City of Mission
*WA 15 – South Conway Lift Station
Prop. Sanitary Sewer and Waterline
Improvement Project*



-2020-

MELDEN AND HUNT, INC.
CONSULTANTS- ENGINEERS-SURVEYORS
EDINBURG, TEXAS
TEXAS REGISTRATION NO. F-1435
19086.01

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MEG SOIL BORING LOG

END OF SECTION

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SECTION 01011

SITE CONDITIONS

PART 1: GENERAL

1.01 SITE INVESTIGATION AND REPRESENTATION

- A. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work; the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, traffic conditions, or similar physical conditions at the site; the conformation and conditions of the ground; the character of equipment and facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this Contract.
- B. The Contractor further acknowledges that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials to be encountered. Any failure by the Contractor to acquaint himself with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the work. Neither the Owner nor the Engineer assume responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner or the Engineer.
- C. Existing ground profiles shown on the Plans were plotted from field surveys.

1.03 RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

- A. Known utilities and structures adjacent to or encountered in the work are shown on the Drawings. The locations shown are taken from existing records and the best information available from existing plans however, it is expected that there may be some discrepancies and omissions in the locations and quantities of utilities and structures shown. Those shown are for the convenience of the Contractor only, and no responsibility is assumed by either the Owner or the Engineer for their accuracy or completeness.
- B. Neither the Owner nor his officers or agents shall be responsible to the Contractor for damages as a result of the Contractor's failure to protect utilities encountered in the work.
- C. The Contractor shall at all times provide unobstructed access to fire hydrants, underground conduit, manholes, and water or gas valve boxes.

- D. Where the Contractor's operations could cause damage which might result in considerable expense, loss, and inconvenience when his operations are adjacent to or near railway, telegraph, telephone, television, power, oil, gas, water, sewer, irrigation, or other systems, no operations shall be commenced until the Contractor has made all arrangements necessary for the protection of these utilities and services.
- E. The Contractor shall notify all utility offices that are affected by the construction operation at least 15 days in advance of commencing construction operations. The Contractor shall not expose any utility without first obtaining permission from the affected agency. Once permission has been granted, locate and, if necessary, expose and provide temporary support for all existing underground utilities in advance of operations.
- F. The Contractor shall be solely and directly responsible to the Owners and operators of such utility properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage that may result from the construction operations under this Contract.
- G. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, the Contractor shall promptly notify the proper authority and cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no event shall interruption of any water or utility service be allowed unless prior approval is granted by the owner of the utility.
- H. The Contractor shall replace, at his own expense, any and all other existing utilities or structures removed or damaged during construction, unless otherwise provided for in these Contract Documents.
- I. Where existing utility lines or structures are so located as to physically conflict with permanent structures to be constructed under this Contract, the conflicting utility line or structure shall be permanently relocated. Such relocations shall be considered as required by this CONTRACT.
- J. The Contractor shall give immediate notice to the Engineer, the Owner and the owner of the utility (where applicable) when a physical conflict is determined to exist. The actual relocation of a public utility will be accomplished by the owner of the utility at his expense unless otherwise specified in these Contract Documents. Any delays resulting from the required relocations of the utilities are the responsibility of the Contractor.
- K. Where existing utility lines or structures are so located as to interfere with the Contractor's prosecution of the work, but do not physically conflict with completed manholes or other permanent structures to be constructed under this

Contract, any modification, alteration, or relocation of interfering utility, either permanent or temporary, shall be accomplished at the expense of the Contractor.

- L. The contractor shall give immediate notice to the Engineer and the Owner of the utility when an interference is determined to exist and shall obtain approval to relocate such utility or to discontinue service therein from the Engineer and the owner of the utility. The owner of the utility shall have the right to do all work required to discontinue, relocate, and replace interfering utilities and charge the Contractor for all costs thereof. When approved by the Engineer and the owner of the utility, all work required to discontinue, relocate, and replace interfering utilities may be done by, or arranged for, by the Contractor. All such discontinuance, relocation, and replacement shall be accomplished in accordance with all requirements of the owner of the utility.
- M. When notified by the Contractor that an interference or conflict has been determined to exist, the Engineer will determine whether such interference shall be considered as required by construction or as incidental to construction.

1.04 INTERFERING STRUCTURES

- A. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground. An attempt has been made to show major structures on the Plans. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed, and it is presented as a guide to avoid known possible difficulties.
- B. Protect existing structures from damage, whether or not they lie within the right-of-way or the limits of the easements obtained by the Owner. Where existing structures must be removed to properly carry out the work, or are damaged during the work, they shall be restored at the Contractor's own expense to at least their original condition and to the satisfaction of the Engineer.
- C. The Contractor may, with the approval of the Engineer and without additional compensation, remove and replace in a condition as good as or better than original, any small interfering structures such as fences and signposts that interfere with the Contractor's operations.

1.05 FIELD RELOCATION

- A. During the progress of the work, minor relocations of the work may be necessary. Such relocations shall be made only by direction of the Engineer. If existing structures are encountered that will prevent construction as shown, notify the Engineer before continuing with the work in order that the Engineer may make such field revisions as necessary to avoid conflict with the existing structures. If the Contractor should fail to notify the Engineer when an existing

structure is encountered and proceeds with the work despite this interference, he shall be responsible for any damage that may occur.

1.06 LAND MONUMENTS

- A. The Contractor shall preserve or replace any existing Federal, State, County, City, and private land monuments encountered. All monument replacement by the Contractor shall be performed by a land surveyor licensed in the State of Texas.

1.07 PAYMENT

- A. The work specified in this Section shall be considered incidental and payment will be included as part of the appropriate lump sum or unit prices specified in the Bid Form.

END OF SECTION

SECTION 01014

PROTECTION OF THE ENVIRONMENT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The General Contractor in executing the work, shall maintain all work areas on and off the site free from environmental pollution that would be in violation of any Federal, State, or local regulations.

1.02 PROTECTION OF WATERWAYS

- A. The Contractor shall observe the rules and regulations of the State of Texas and agencies of the U.S. Government prohibiting the pollution of any lake, stream, river, or wetland by the dumping of any refuse, rubbish, dredge material, or debris therein.
- B. Contractors are specifically cautioned that disposal of materials into any waters of the State must conform with the requirements of the Texas Commission on Environmental Quality, and an applicable permit from the U.S. Army Corps of Engineers.
- C. The Contractor shall be responsible for providing holding ponds or an approved method which will handle, carry through, or divert around his work all flows, including storm flows and flows created by construction activity, so as to prevent silting of waterways or flooding damage to the property or adjacent properties.
- D. Regarding Stormwater Pollution Prevention, the Contractor shall prepare the NOI and the Contractor will be responsible for the preparation and implementation of the SW3P from the beginning to the end of the project.

1.03 DISPOSAL OF EXCESS EXCAVATION AND OTHER WASTE MATERIALS

- A. Excess excavated material not required or suitable for backfill and other waste material must be disposed of at sites approved by the Owner and Engineer.
- B. Unacceptable disposal sites, include, but are not limited to, sites within a wetland or critical habitat and sites where disposal will have a detrimental effect on surface water or groundwater quality.
- C. The Contractor may make his own arrangements for disposal subject to submission of proof to the Engineer that the owner(s) of the pro-proposed site(s) has a valid fill permit issued by the appropriate governmental agency and submission of a haul route plan including a map of the proposed route(s).

- D. The Contractor shall provide watertight conveyance of any liquid, semi-liquid, or saturated solids which tend to bleed or leak during transport. No liquid loss from transported materials will be permitted whether being delivered to the construction site or being hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at the selected disposal site.

1.04 NIGHTTIME WORK

- A. If the Contractor desires to execute any work between the hours of 6 p.m. and 7 a.m., he shall notify the Engineer in writing at least 48 hours before the intended start of such work. The Contractor shall acquire any necessary permits associated with night work and comply with all permit conditions and all laws and ordinances relating to night work. Rio Mobile Home Park shall approve in writing any work outside of workdays between 7 a.m. and 6 p.m. at least 24 hours in advance of scheduled work.

1.05 PAYMENT

- A. The work specified in this Section shall be considered incidental and payment will be included as part of the appropriate lump sum or unit prices specified in the Bid Form.

END OF SECTION

SECTION 01035

CONTROL OF WORK

PART 1: GENERAL

1.01 EQUIPMENT

- A. The Contractor shall furnish equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Agreement. If at any time the equipment appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character or increase the equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of work and rate of progress required.

1.02 PRIVATE LAND

- A. The Contractor shall not enter or occupy private land outside of easements, except by written permission of the respective landowner.

1.03 PIPE LOCATIONS

- A. Pipelines shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench,

prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.

- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

1.05 TEST PITS

- A. Test pits for the purpose of locating underground pipelines or structures in advance of the construction shall be excavated and backfilled by the Contractor at the direction of the Engineer. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.06 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street or driveway received in writing from the proper authority, all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.
- B. Detours around construction will be subject to the approval of the proper authority and the Engineer. Where detours are permitted, the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the Contractor shall expedite construction operations and periods when traffic is being detoured.
- C. The Contractor shall take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

1.07 BLASTING

- A. No blasting will be allowed on this project.

1.08 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the

work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in some other manner acceptable to the Engineer.

1.09 MAINTENANCE OF FLOW

- A. The Contractor shall, at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.

1.10 COOPERATION WITHIN THIS CONTRACT

- A. The Contractor shall cooperate with Subcontractors or trades, and shall assist in coordinating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the Contractor and his subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.11 CLEANUP

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.

1.12 PAYMENT

- A. Payment for the work in this Section will be included as part of the total lump sum or appropriate unit prices stated in the Bid Form,

END OF SECTION

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SECTION 01311

SCHEDULE AND SEQUENCE OF CONSTRUCTION

PART 1: GENERAL

CONSTRUCTION SCHEDULING GENERAL PROVISIONS

- A. No work shall be done between 6:00 P.M. and 7:00 A.M. nor on weekends or legal holidays without the written permission of the owner. Emergency work may be done without prior permission, however, notification is required,
- B. Night work may be established by the Contractor as regular procedure with the written permission of the Owner. Such permission, however, may be revoked at any time by the Owner if the Contractor fails to maintain adequate lighting equipment, and supervision for the proper prosecution and control of the work at night, or if the off-site effects of night construction are deemed by the Owner to be unacceptable.
- C. The Contractor shall be fully responsible for providing all temporary piping, plumbing, electrical hook-ups, heating, ventilating, air conditioning, lighting, temporary structures, and such other items required. All details of temporary piping and temporary construction are not indicated in the Plans or these Specifications. However, this does not relieve the Contractor of the responsibility to provide the necessary facilities.

1.02 PROGRESS OF THE WORK

- A. The work shall be started within 7 days following the effective date of the Agreement, and the work shall be executed with such progress as may be required to prevent any delay to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such personnel, materials, and equipment to assure completion of the work in the time established by the Agreement.
- B. If the Contractor for his convenience and at his own expense, should desire to carry on his work at night or outside regular hours, he shall submit written notice to the Engineer, and he shall allow ample time for satisfactory arrangements to be made for inspecting the work in progress. The Contractor shall pay the expenses for extra inspection required for work outside regular hours. Normal working hours for this purpose are Monday through Friday 7:00 A.M. to 6:00 P.M. The Contractor shall light the different parts of the project as required to comply with all applicable Federal and State regulations and with all applicable requirements of set forth by Cameron County.

1.03 CONSTRUCTION SCHEDULE

- A. The Contractor shall, within seven (7) days after the effective date of the Agreement, provide and submit to the Engineer for approval, the Schedule for the 45 days of activities. The Schedule shall account for all the work of the Contractor and his subcontractors and suppliers. In addition to all reasonably important construction activities, the schedule shall provide for the proper sequence of construction considering the various crafts, purchasing time, submittal approval, material delivery, equipment fabrication, similar time-consuming factors, time necessary to provide temporary pumping, piping, diversion, interconnections, etc.
- B. The Schedule shall include as a minimum, the earliest starting and finish dates, and latest starting and finish dates, and the total float for each task or item. The Contractor shall update (monitor) the schedule at least monthly and shall submit to the Engineer each month a copy of the updated schedule at the same time the pay estimate is prepared. The Schedule shall contain all of the items of the Periodic Estimate and Pay Schedule.

While the Contractor bears full responsibility for scheduling all phases and stages of the work to insure its successful prosecution and completion within the time specified in accordance with all provisions of these Specifications, the Contractor is specifically required to complete fully or complete such stages of work to enable his subcontractors and suppliers to complete their work within the respective times specified.

- C. If the Engineer determines that operations are falling behind schedule at any time during the construction period, the Owner may require the Contractor to add to his equipment and/or construction forces, including increases in working hours, in such quantities as are required to bring operations back on schedule. Upon receipt of written communication from the Owner requiring such addition, the contractor shall furnish same at no additional cost to the Owner, including cost of additional inspection forces.

1.04 PRECONSTRUCTION CONFERENCE

- A. A preconstruction conference shall be held as soon as possible after Award of Contract and before work is started. The conference will be held at a location selected by the Owner. The conference will be attended by:
 - 1. Contractor's Office Representative.
 - 2. Contractor's General Superintendent.
 - 3. Any subcontractors' or suppliers- representatives whom the Contractor may desire to invite, or the Engineer may request.

4. Engineer's Representatives.
 5. Owner's Representatives.
- B. A suggested format would include but not be limited to the following subjects:
1. Check of required bonds and insurance certifications,
 2. Liquidated damages.
 3. Shop drawing submittal and approval procedure.
 4. Chain of command, direction of correspondence, and coordinating responsibility between Contractors.
 5. Request for periodic job meetings for all involved.
 6. Introduction of the key project personnel.
 7. Laboratory testing of material requirements.
 8. Inventory of material stored on site provisions.
 9. Progress estimate and payment procedure.
 10. Discussion of Contractor's Safety program.
- C. The Engineer will preside at the conference, prepare the minutes of the meeting and distribute copies of same to all participants who so request by fully completing the attendance form to be circulated at the beginning of the conference.

1.05 CONSTRUCTION SEQUENCE

- A. Certain features have been included in this project to facilitate construction, and certain observations have been made concerning construction methods which may have to be used to complete the work within the time constraints set in these documents. However, proper construction scheduling and completion of the work within the established contract time shall remain the sole responsibility of the Contractor.

END OF SECTION

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SECTION 01340

SUBMITTALS

PART 1: GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. The Section specifies the general methods and requirements of submissions applicable to the following work-related submittals in three categories: (1) Shop Drawings, Product Data, and Samples, (2) Construction Photographs and (3) Workmanship Bonds. Detailed submittal requirements are specified in the technical specifications sections.

1.02 SCHEDULE

- A. The Contractor shall, within fifteen (15) days after the effective date of the Agreement, provide and submit to the Engineer for approval, the Schedule for the first 60 days of activities.
- B. Within 45 days after the effective date of the Agreement the Contractor shall provide and submit to the Engineer the schedule he plans to maintain in order to successfully construct the work within the time allotted. The completed schedule shall be approved before additional monthly payments are made.

1.03 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

- 1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and installation drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
- 2. Shop drawings for components of a system shall be submitted with all other system components as a complete shop drawing package. Failure to do so will cause rejection of individual submittals.
- 3. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for preliminary checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

4. All subcontractor's shop drawings submitted by the Contractor shall be checked regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
5. All details on shop drawings submitted for approval shall show clearly the elevations of the various parts of the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.

B. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliance and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing, and printed product warranties, as applicable to the Work.

C. Samples

1. Samples, as specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the Work.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A.** The Contractor shall review shop drawings, product data and samples prior to submission to the Engineer to determine and verify the following:
1. Field measurements.
 2. Field construction criteria.

3. Catalog numbers and similar data.
 4. Conformance with the Specifications.
- B. Each shop drawing, working drawing, sample and catalog data submitted by the Contractor shall have affixed to it the following Certification Statement, signed by the Contractor: "Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."
 - C. Notify the Owner in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
 - D. The review and approval of shop drawings, samples or catalog data by the Engineer shall not relieve the Contractor from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility as a result of review and approval.
 - E. Prequalification of any equipment shall not relieve the Contractor of the responsibility to submit complete shop drawings for the Engineer's review and approval.
 - F. No portion of the work requiring a shop drawing, working drawing, sample, or catalog data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
 - G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, working drawings, applicable samples, and catalog data.

1.05 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor.
- B. Number of submittals required:
 1. Shop Drawings: Submit seven copies.

2. Product Data: Submit seven copies.
3. Samples: Submit the number stated in the respective Specification Sections,

Submittals shall contain:

1. The date of submission and the dates of any previous submissions .
2. The Project title and number.
3. Contractor identification.
4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. Two 3-in x 3-in blank spaces for Contractor and Engineer stamps.

1.06 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Engineer and resubmit until approved. No submittal will be considered approved until stamped by Contractor and Engineer.
- B. Shop Drawings and Product Data:
 1. Revise initial drawings or data, and resubmit as specified for the initial submittal,

2. Indicate any changes which have been made other than those requested by the Engineer.

C. Samples: Submit new samples as required for initial submittal.

1.07 DISTRIBUTION

- A. Distribute reproductions of approved shop-drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed seven.

1.08 CONSTRUCTION PHOTOGRAPHS

- A. The term "photograph" as used herein refers to a photographic view, including similar exposures taken to assure the usefulness of the photographic record. All photographs shall be taken in color, not black and white.
- B. The Contractor shall take such photographs as required to document the existing conditions of the areas where construction activities will disturb the existing sites. These photographs are to be taken prior to start of any construction. The photographs of the existing conditions will be used as evidence in disputes related to bringing a site back to an equal or better condition. The same views shall be rephotographed upon completion of all construction activities. Double copies of these photographs shall be made. One copy is to be retained by the Contractor, and the other is to be given to the Engineer.

1.9 GENERAL PROCEDURES FOR SUBMITTALS

- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

1.10 WORKMANSHIP BONDS

- A. Where specific units of work require the issuance of a bond or similar provision, as a means of assuring the Owner that certain possible failures of the work to perform as represented will be rectified at someone else's expense, submit fully executed bond backed by a surety company acceptable to the Owner and in the

principal amount indicated. Include information sheet for the Owner's maintenance/operating personnel outlining proper procedures in case of failure or other instances which might affect the validity of the bond; list names, addresses and telephone numbers for the Owner's emergency and follow-up in connection with implementation of each bond.

1.11 INCLUSION OF SUBMITTALS, SPARE PARTS AND SPECIAL TOOLS

- A. The submittals of shop drawings, product data, samples and workman-ship bonds as required in this Section and the Technical Sections of these Specifications, and the operation and maintenance manuals and special tools and spare parts as required, shall be considered as integral parts of the equipment for which they are required. No partial payments nor payments for materials on hand will be made for any materials or equipment which require submission of shop drawings and/or operation and maintenance manuals, unless such submittals have been made, and the Engineer has found them acceptable. No final payment will be made until all required shop drawings, operation and maintenance manuals. Special tools, accessories and spare parts have been submitted to the Engineer or delivered to the Owner, as is appropriate.

1.12 REPETITIVE REVIEW

- A. Shop drawings and O&M manuals submitted for each item will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer.
- B. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time unless delay of the Work is directly caused by failure of Engineer to return into the mails any submittal within 21 days after its receipt in his office.

1.13 PAYMENT

- A. The work specified in this Section shall be considered incidental and payment will be included as part of the appropriate lump sum or unit prices stated in the Proposal.

END OF SECTION

SECTION 01655

GRAVITY PIPELINE TESTING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall test sanitary system pipelines in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01340 – Contractor Submittals.
- B. Furnish:
 - 1. A testing plan and schedule including methods for water conveyance, control, leak testing, and water disposal shall be submitted in writing for approval.
 - 2. Where deflection testing of flexible pipe is required, submit a method for mandrel testing or other measurement, as applicable to pipe size.

PART 2 -- PRODUCTS

2.1 DEFLECTION MANDREL

- A. Mandrel Design: The CONTRACTOR shall construct a mandrel of steel or rigid plastic which can withstand a force of 200 psi without deforming. The mandrel shall have 9 or more "runners" or legs, as long as the number is an odd number. The mandrel barrel length shall be at least 75 percent of the pipe inside diameter.
- B. Mandrel Diameter: The outside diameter shall taper out to 95 percent of the inside diameter of the pipe. For the purpose of determining the mandrel diameter, the inside diameter of the pipe shall be the average outside diameter of the pipe minus 2 minimum wall thicknesses for OD controlled pipe and shall be the average inside diameter for ID controlled pipe, all dimensions in accordance with the respective pipe standards. Statistical or "tolerance packages" shall not be considered in mandrel sizing. The mandrel shall be stamped or engraved at a location other than a runner with the pipe size and material it is intended to test.

PART 3 -- EXECUTION

3.1 GENERAL

MELDEN & HUNT, INC.
115 WEST MCINTYRE STREET
EDINBURG, TEXAS 78539

- A. Gravity sewer pipes and service laterals shall be tested for exfiltration or infiltration and deflection as indicated. Manholes shall be tested for leakage prior to backfill placement, whereas pipes shall be backfilled prior to testing. The maximum length of pipe tested shall be the four reaches between 5 manholes. Leakage tests shall be completed and approved prior to placing of permanent resurfacing of pavement. When leakage or infiltration exceeds the allowed amount, the CONTRACTOR shall locate the leaks and make the necessary repairs or replacements to reduce the leakage or infiltration to the allowable limits. Individually detectable leaks shall be repaired, regardless of whether the test results are acceptable or not.
- B. Unless otherwise indicated, water for testing will be furnished by the OWNER; however, the CONTRACTOR shall convey the water from the OWNER-designated source to the points of use.
- C. No materials shall be used which would be injurious to pipeline structure and future function. Air test gauges shall be laboratory-calibrated test gauges, and if required by the ENGINEER, shall be recalibrated by a certified laboratory prior to the leakage test. Air test gauges shall have a size and pressure range appropriate for the pipe being tested.
- D. Testing operations shall be performed in the presence of the ENGINEER.

3.2 TESTING SCHEDULE

A. Leakage Tests

1. Perform the type of leakage tests determined from the table below, based on pipe size, slope between manholes (Criterion 1), and difference in water levels (Criterion 2).

Nominal Pipe Size	Criterion 1		Criterion 2	
	Manhole Delta H, feet		Test Water vs Ground Water Delta H, feet	
	Less than or equal to 10 ft.	Greater than 10 ft.	greater than or equal 4 ft.	less than 4 ft.
less than or equal to 24 inches	See Criterion 2	Infiltration or Air (See Note 1)	Exfiltration	Infiltration or Air
greater than 24 inches	See Criterion 2	See Criterion 2	Exfiltration	Infiltration

Note 1. If ground water is present, perform an infiltration test or air test at the option of the CONTRACTOR; if no ground water is present, perform an air test.

2. Definitions

- a. Delta H is the difference between 2 elevations, expressed in feet.
- b. Manhole Delta H is the invert elevation difference in 2 adjacent manholes.
- c. Test Water vs Ground Water Delta H is the required elevation of water surface for testing minus the average elevation of ground water adjacent to the pipe to be tested.

3. For pressure sewers and force mains, conduct water pressure tests as required by Section 01656 - Pressure Pipe Testing and Disinfection.

B. Deflection Tests: Flexible pipe 30 inches and smaller shall be tested for deflection by the mandrel test. Larger flexible pipe shall be tested by a method approved by the ENGINEER. Excessively deflected pipe shall be removed and replaced.

3.3 WATER EXFILTRATION TEST

A. Each section of sewer shall be tested between successive manholes by closing the lower end and the inlet sewers of the upper manhole with stoppers or inflatable plugs. The pipe and manhole shall be filled with water to a point 4 feet above the centerline of the sewer at the center of the upper manhole; or if ground water is present, 4 feet above the average adjacent ground water level, whichever is higher.

B. Water shall remain in the pipe for at least one hour or until the water level stabilizes, whichever is longer, before the test begins. The minimum test duration shall be 4 hours.

C. Unless indicated otherwise, the CONTRACTOR shall measure exfiltration. Measure the amount of water added to the upstream manhole to maintain the water level at the elevation set above. Compare the amount added to the allowable leakage calculated below, and if the amount added is equal to or less than the allowable amount, the tested section of the pipe has passed.

D. The allowable leakage will be computed by the formula:

$$E = 0.000012 LD (H)^{1/2}$$

Where:

- E = Allowable leakage in gallons per minute of sewer tested.
- L = Length of sewer and house connections tested, in feet.
- D = Internal diameter of the pipe in inches.

H = Difference in elevation between the water surface in the upper manhole and the centerline of the pipe at the lower manhole; or if ground water is present above the centerline of the pipe in the lower manhole, the difference in elevation between the water surface in the upper manhole and the ground water at the lower manhole.

3.4 WATER INFILTRATION TEST

- A. The end of the sewer at the upper structure shall be closed to prevent the entrance of water, and pumping of ground water shall be discontinued for at least 3 days, after which the section shall be tested for infiltration.
- B. The infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed by the formula above, where H is the difference in the elevation between the ground water surface and the invert of the sewer at the downstream manhole.
- C. Unless otherwise indicated, infiltration shall be measured by the CONTRACTOR.

3.5 AIR PRESSURE TEST

- A. The CONTRACTOR shall furnish all materials, equipment, and labor for making an air test. Air test equipment shall be approved by the ENGINEER.
- B. The CONTRACTOR may conduct an initial air test of the sewer main line after densification of the backfill but prior to installation of the service laterals. Such tests will be considered to be for the CONTRACTOR's convenience and need not be performed in the presence of the ENGINEER.
- C. Each section of sewer shall be tested between successive manholes by plugging and bracing all openings in the pipe and the upper ends of all service laterals. Prior to insertion in the sewer, each plug shall be checked with a soap solution to detect any air leakage. If any leaks are found, the air pressure shall be released and the leaks eliminated or the plug replaced.
- D. The test of the pipe and service laterals shall be conducted in the presence of the ENGINEER. Testing of pipe, regardless of the pipe material, shall be performed in accordance with ASTM F 1417 - Standard Test Method for Installation of Plastic Gravity Sewer Line Using Low Pressure Air.
- E. Air pressure in the sewer line shall be increased to 4.0 psi above groundwater pressure (1.0 psi for each 2.3 feet of water elevation above the highest point of the pipe). Do not allow the pressure at any point in the pipe to reach 9 psi under any circumstances. Allow the pressure to stabilize for 5 minutes, then reduce

the pressure to 3.5 psi above groundwater pressure and start the test. Stop the air release and record the decrease in pressure over time.

- F. Pass/Fail Criterion: The time taken for the pressure to decrease from 3.5 to 2.5 psi above groundwater pressure shall be equal to or greater than the time below

Nominal Pipe Diameter Inches	Minimum Time min:sec	Length for Minimum Time, ft	Increased Time for Longer Lengths, seconds per foot
4	3.46	597	0.038
6	5.40	398	0.854
8	7.34	298	1.520
10	9.26	239	2.374
12	11.20	199	3.418
18	17.00	133	7.692
24	22.40	99	13.674
30	28.20	80	21.366
36	34.00	66	30.768

- G. Testing criteria of pipe 12-inches and larger may be adjusted if the ENGINEER approves. The air pressure decrease may be 0.5 psi instead of 1.0 psi, and the corresponding minimum times will be one-half of the tabulated times.
- H. For pipe larger than 24 inches, air pressure tests may be performed on each joint. The time for the pressure to fall from 3.5 to 2.5 psi, both above groundwater pressure, shall not be less than 10 seconds regardless of pipe diameter.
- I. If the time is less than the allowable time, the pipe will be considered defective and shall be repaired and retested.

3.6 DEFLECTION TEST

A. Mandrel Test

1. The ENGINEER shall be allowed to test the mandrel with the proving ring at any time. The mandrel shall pass through the proving ring with no greater than 0.02 inch clearance, and if it does not, the mandrel will be considered defective and shall be replaced.
2. The CONTRACTOR shall test all flexible pipe 30 inches and smaller for deflection, joint displacement, and other obstructions by passing the

mandrel through the pipe not less than 30 days after completion of the trench backfill.

3. Pipe with diameter less than the mandrel will be considered defective, and the CONTRACTOR shall replace it.
- B. Flexible pipe in sizes larger than 30 inches shall have deflections measured by a rigid metal bar, a rigid frame, or other method approved by the ENGINEER.
1. The average inside diameter shall be measured before the pipe is installed and backfilled.
 2. Deflection is defined as the difference between vertical inside diameter in the pipe before and after installation and backfilling.

3.7 MANHOLE TEST

- A. Sewer manholes shall be hydrostatically or vacuum tested for leakage prior to backfilling. Prior to testing, manholes shall be visually inspected for obvious defects. Leaks or cracks shall be repaired to the satisfaction of the ENGINEER.
- B. Hydrostatic Testing: All pipes entering the manhole shall be sealed at a point outside the manhole walls to include testing of the pipe to manhole joints. The manhole shall be filled with water to a level 2 inches below the top of the frame. Safety lines shall be secured to all plugs utilized. After a period of at least one hour to allow the water level to stabilize, the manhole shall be refilled and the water level shall be marked. The water level shall again be checked after 4 hours. If the water level falls more than 1-inch, the leakage shall be considered excessive, and the CONTRACTOR shall make repairs and retest the manhole. The exterior of the manhole shall be inspected during this period for visible evidence of leakage. Visible moisture, sweating, or beads of water on the exterior of the manhole shall not be considered leakage, but any water running across the surface will be considered leakage and shall be repaired to the satisfaction of the ENGINEER regardless of the volume of water lost.

C. Vacuum Testing

1. Install the vacuum test head on top of the manhole. Install and brace sealing devices on influent and effluent pipes
2. With a vacuum pump, draw a vacuum of 10 inches of mercury, deactivate the pump, and measure the time in seconds for the vacuum to drop to 9 inches of mercury.
3. Compare the time to the table below.

Manhole Depth,ft	Minimum Time, min:sec			
	Manhole Diameter, inches			
	36	48	60	72
8	0:14	0:20	0:26	0:33
10	0:18	0:25	0:33	0:41
12	0:21	0:30	0:39	0:49
14	0:25	0:35	0:48	0:57
16	0:28	0:40	0:52	1:07
18	0:32	0:45	0:59	1:13
20	0:35	0:50	1:05	1:21
22	0:38	0:55	1:12	1:30
24	0:42	0:59	1:18	1:37
26	0:46	1:04	1:25	1:45
28	0:49	1:09	1:31	1:53
30	0:53	1:14	1:38	2:01

4. If the time is less than the time in the table, the manhole is defective, and it shall be repaired and retested until it is acceptable.

- END OF SECTION -

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SECTION 01665

TRENCH SAFETY SYSTEM

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, and equipment and perform all operations to plan, design, construct, install, maintain, monitor, modify as necessary, and remove upon completion, a Trench Safety System as specified herein.
- B. The requirements of this section apply to all trenches that exceed five feet in depth, as measured from the ground surface to the highest side of the trench to the trench bottom.
- C. All applicable and non-conflicting portions of Section 02221 -Trenching, Backfilling and Compacting apply as appropriate to provide a proper and complete system.

1.02 RELATED REQUIREMENTS

- A. Section 01015: Control of Work
- B. Section 02221: Trenching, Backfilling and Compacting
- C. State of Texas: HB 1569
- D. United States Government: CFR Part 1926, Occupational Safety and Health Standards (OSHA), Subpart P - Excavations, Trenching and Shoring

PART 2: PRODUCTS

2.01 GENERAL

- A. All materials and products incorporated into the Trench Safety System shall be suitable for their intended use shall meet all design criteria and parameters used by the Trench Safety System designer in designing the system and shall meet all applicable requirements of the OSHA regulations.

PART 3: EXECUTION

3.01 PROCEDURES

- A. Prior to commencement of any trenching operation, but not later than 30 calendar days following the effective date of the Agreement, the Contractor shall submit a site specific Trench Safety System plan for all portions of the work having trenches deeper than five feet.
- B. The plan shall be detailed to the extent that it shows the proposed limits (to the nearest foot) of the various types of trench safety systems the Contractor proposes to use.
- C. The Contractor may rely on the published borings to the greatest extent possible in developing the plan.
- D. After a review as to form only, without review for adequacy, by the Engineer and Owner's staff, the plan will be forwarded to the Owner and/or Project Representative for use in monitoring the Contractor's construction activities.

Contractor accepts sole responsibility for compliance with all applicable safety requirements. The review by the Engineer and Owner's staff is only for general conformance with State of Texas and OSHA safety standards. Release of the safety plan for use in monitoring construction activities does not relieve Contractor from any or all construction means, methods, techniques and procedures; and any property damage or bodily injury (including death) that arises from use of the trench safety plan, from Contractor's negligence in performance of contract work, or from Engineer's or Owner's failure to note exceptions to the safety plan, shall remain the sole responsibility and liability of the Contractor.

- E. Changes in the trench safety plan after initiation of construction, either for the Contractor's convenience or in response to unforeseen or differing conditions; are not cause for extension of time or change order, and will require the same review process as the original plan.

3.02 METHODS

- A. Contractors have two ways to meet OSHA Standards for trench safety and comply with the provisions of this section. The two methods are:
 - 1. Use of a Trench Box.
 - 2. Shoring, Sheet piling and Bracing Methods.
- B. Contractors electing to use a Trench Box shall include in the Trench safety Plan:
 - 1. Physical dimensions, type and grade of materials, position in the trench, expected loads, strength of the box, and all associated design calculations necessary to show that the proposed trench box is adequate for the trench conditions expected to be encountered.

2. Waiver of claim for delay cost.
- C. Contractors electing to use Shoring, Sheet piling and Bracing shall include in the Trench Safety Plan:
1. Dimensions, type and grade of materials of all uprights, stringers and cross braces and spacing of each required to meet OSHA Standards for trench safety and comply with the requirements of this section.
 2. All associated design calculations necessary to show that the proposed system is adequate for the trench conditions expected to be encountered.
 3. Waiver of claims for delay cost.

3.03 MEASUREMENT AND PAYMENT

- A. The work specified in this Section shall be based on linear feet of trench protection as provided for in the Bid Form.

END OF SECTION

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SECTION 01700

CONTRACT CLOSE-OUT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This Section outlines the procedure to be followed in closing out the contract.

1.02 SUBSTANTIAL COMPLETION

- A. The substantial completion date shall be established as stated in the Agreement.

1.03 FINAL CLEANING

- A. At the completion of work and immediately prior to final inspection, cleaning of the entire project shall be accomplished according to the following provisions:
1. The Contractor shall thoroughly clean, sweep, wash, and polish all work and equipment provided under the Contract, including finishes. The cleaning shall leave the structures and site in a complete and finished condition to the satisfaction of the Engineer.
 2. All Subcontractors shall similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.
 3. The Contractor shall remove all temporary structures and all debris, including all dirt, sand, gravel, rubbish and waste material. See Section 01510, Temporary Facilities and Utilities.
 4. Should the Contractor not remove rubbish or debris, or not clean the buildings and site as specified above, the Owner reserves the right to have the cleaning done at the expense of the Contractor.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.
- D. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

- E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish.
- F. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
- G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.

1.04 FINAL INSPECTION

- A. After final cleaning and restoration and upon written notice from the Contractor that the work is completed, the Engineer will make a preliminary inspection with the Owner, and the Contractor present. Upon completion of this preliminary inspection, the Engineer will notify the Contractor, in writing, of any particulars in which this inspection reveals that the work is defective or incomplete.
- B. Upon receiving written notice from the Engineer, the Contractor shall immediately undertake the work required to remedy deficiencies and complete the work to the satisfaction of the Engineer.
- C. When the Contractor has corrected or completed the items as listed in the Engineer's written notice, he shall inform the Engineer, in writing, that the required work has been completed. Upon receipt of this notice, the Engineer, in the presence of the Owner and the Contractor, will make his final inspection of the project.
- D. Should the Engineer find all work satisfactory at the time of his inspection, the Contractor will be allowed to make application for final payment in accordance with the provisions of the General Conditions. Should the Engineer still find deficiencies in the work, the Engineer will inform the Contractor of the deficiencies and will deny the Contractor's request for final payment until such time as the Contractor has satisfactorily completed the required work.

1.05 FINAL SUBMITTALS

- A. No application for final payment will be accepted until all submittals have been made and approved by the Engineer, including, but not limited to, the following:
 - 1. Final shop drawings.
 - 2. Project Record Documents
 - 3. All interface information.

4. All Operation and Maintenance Manuals.
5. All required indices and schedules.
6. All Manufacturers' Certificates of Proper Installation.
7. All construction photographs, including those of the completed project.
8. All State and Federal required submittals.

1.06 ACCESSORY ITEMS

- A. The Contractor shall provide to the Owner, upon acceptance of the equipment, all special accessories required to place each item of equipment in full operation. These special accessory items include, but are not limited to, the specified spare parts, adequate oil and grease as required for the first lubrication of the equipment, light bulbs, fuses, hydrant wrenches, valve wrenches, valve keys, handwheels, and other expendable items as required for initial startup and operation of all equipment.

1.07 GUARANTEES, BONDS, AND AFFIDAVITS

- A. No application for final payment will be accepted until all guarantees, bonds, certificates, licenses, and affidavits required for work or equipment as specified are satisfactorily filed with the Engineer.

1.08 RELEASE OF LIENS OR CLAIMS

- A. No application for final payment will be accepted until satisfactory evidence of release of liens has been submitted to the Owner as required by the General Conditions.

1.09 FINAL PAYMENT

- A. Final payment will be made to the Contractor in accordance with the General Conditions.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION (NOT USED)

END OF SECTION

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1: GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the Owner one record copy of:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change orders and other Modifications to the Contract.
 - 5. Engineer's Field Orders or written instructions.
 - 6. Approved Shop Drawings, Working Drawings and Samples.
 - 7. Field Test records.
 - 8. Construction photographs.

1.02 RELATED REQUIREMENTS

- A. Section 01340: Shop Drawings, Working Drawings and Samples.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI/CSC format.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by the Engineer.
- E. As a prerequisite for monthly progress payments, the Contractor is to exhibit the currently updated record documents for review by the Engineer and the Owner.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.
- C. Drawings - Legibly mark to record actual construction:
 - 1. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of pipe fittings, underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.
 - 2. Field changes of dimension and detail.
 - 3. Changes made by Field Order or by Change Order.
 - 4. Details not on original contract drawings.
 - 5. Equipment relocation and piping.
- D. Specifications and Addenda - Legibly mark each Section to record:
 - 1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
 - 2. Changes made by Field Order or by Change Order.
- E. Shop Drawings (after final review and approval):
 - 1. Five sets of record drawings for each piece of equipment, piping, electrical system and instrumentation system.

1.05 SUBMITTAL

- A. At Contract close-out, deliver Record Documents to the Engineer for the Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each Record Document.
 - 5. Signature of Contractor or his authorized representative.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1: GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile all specified warranties and bonds.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the Engineer for review and transmittal to Owner.

1.02 RELATED REQUIREMENTS

- A. Instructions to Bidders: Bid Bonds.
- B. Conditions of the Contract: Performance Bond, Payment Bond and Maintenance Bond.
- C. Section 01700: Contract Close-out.

1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.

6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
7. Contractor, name of responsible principal, address and telephone number.

1.04 FORMS OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 1. Size 8-1/2 inches x 11 inches, punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.
 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2 inches.

1.05 WARRANTY SUBMITTAL REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by the Owner.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Division 11, 13, 15 and 16 and which has a 1 HP motor or which lists for more than \$1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
- C. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of Owner acceptance, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the

manufacturer shall not relieve the Contractor of the one-year warranty starting at the time of Owner acceptance of the equipment.

END OF SECTION

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SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This section shall govern the excavation, trenching, and backfilling for water main and sanitary sewer main construction, unless otherwise noted on the plan details and the specifications. The work shall include all necessary drainage, dewatering, pumping, bailing, sheeting, shoring and incidental construction. All existing utilities shall be protected from damage during the excavation and backfilling of trenches and, if damaged, shall be replaced by the Contractor at his expense. Unless otherwise shown on the plans, proposal, or contract documents, all excavation shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed, to include rock, stone, sand, organic material, or whatever material is encountered.

1.02 PROTECTION

- A. In accordance with Section 01665, the Trench Excavation Safety Protection shall be accomplished as required by the most recent provisions of Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration (OSHA) Standards and Interpretations, as may be amended.
- B. Sheeting and Bracing in Trenches
1. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. If the Owner is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed they shall be immediately filled and rammed.
 2. The Contractor shall leave in place, to be embedded in the back-fill, all sheeting and bracing which the Owner may direct him in writing to leave in place at any time during the progress of the work for the purpose of

preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.

3. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed.
4. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his Part to issue such orders. Failure to exercise this right shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
5. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one foot above the top of any pipe.

B. Control of Groundwater Level

1. The Contractor shall maintain the groundwater level at or below the subgrade level so that all bedding material and pipe can be placed on a dry, firm subgrade.
2. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
3. Drainage water shall be disposed of in a manner approved by the Owner so that flow or seepage back into the excavated area will be prevented.
4. Removal of dewatering system shall be accomplished after the dewatering system is no longer required: The material and equipment constituting the system, including observation wells, shall be removed by the Contractor.
5. Maintain ground water table at least 12 inches below the finished excavation subgrade.
6. No direct payment shall be made for costs associated with dewatering. All costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

1.03 RELATED REQUIREMENTS

A. Section 01665: Trench Safety System

PART 2: PRODUCTS

2.01 General

- A. Pipeline trenches shall be backfilled with designated materials to the level of the original ground surface, to the underside of the ground base course, to the finished grade, or as shown on the Plans. Before backfilling, the trench shall be cleared of all timber and debris. Backfill shall be compacted to a minimum of 95% density except as otherwise provided herein.
- B. It is highly important that a dense, well-compacted backfill be placed around the pipelines. The contractor will be required to produce such a backfill under all circumstances. The materials used for the backfill, the amount of thereof, and the manner of deposition shall be subject to the approval of the Engineer, but the contractor will be held responsible for any displacement or instability of the pipeline or any damage to the coating caused by improper installation of backfill materials. No material shall be used for trench backfill, which, for any reason cannot be compacted to the degree specified.
- C. For these specifications, backfill shall be divided into four (4) categories: Bedding, Haunching, Initial Backfill and Final Backfill. Bedding shall be defined as that material placed from the foundation up to the flowline of the pipe. At a minimum, bedding shall be 6 inches. Haunching shall be defined as that material placed from the bedding up to the springline of the pipe. Initial backfill shall be that material from the springline of the pipe and extending up to a minimum of six inches above the top of the pipe. Final backfill shall be defined as that material placed in the trench from the top of the initial backfill to the upper limit of backfill required.

2.02 Bedding

- A. If soft, spongy, unstable, or other similar material is encountered upon which the bedding material is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the above amount required by the plans or specifications, will be paid for as provided in the General Conditions. If the necessity for such additional bedding materials has been caused by an act or failure to act on the part of the Contractor, or is required for the control of ground water, the Contractor shall bear the expense of the additional excavation and bedding.

- B. Bedding material shall first be placed, such that a firm, stable and uniform support is provided for the full length of the pipe. Bell holes shall be provided at each joint to permit proper joint assembly. Then the haunching and initial backfill shall be placed to 6" above the top of the pipe. Alternate methods of pipe laying which are recommended by the pipe manufacturer may be used if approved by the Engineer.
- C. Except where otherwise specified, the material for the bedding, haunching and initial backfill envelope shall be a bank sand having a plasticity index of less than 15. The Contractor must submit a small sample of the material to the Engineer for approval.

2.03 Final Backfill

- A. Backfill material for the final backfill zone of the pipe trench may include the excavated soil materials. The backfill shall have sufficient fines for compaction purposes and should have a Plasticity Index (P.I.) not exceeding 25 as determined by ASTM D4318-83. When the pipeline is installed across county the backfill may be placed in 8" lifts and compacted to 90% Standard Proctor. When the pipeline is under pavement or drives, the backfill shall be placed in 8" lifts and compacted to 90% Standard Proctor. The final 12 inches of backfill shall be Type F Grade 3 caliche placed in six inch lifts and compacted to not less than ninety-five percent (95%) for pavement areas of the maximum dry density at + or - 2% optimum moisture content as determined by tests on samples as outlined in Texas Highway Department Testing Method Tex 113-E, unless otherwise shown on the plans.

2.04 Stabilized Backfill

- A. Upon approval of the Engineer, stabilized backfill material may be used in areas where a soft or unstable trench foundation is encountered. The stabilized backfill material shall consist of a mixture of the dry constituents described for "Concrete" (in this section) except that the cement content shall be reduced to two (2) sacks per cubic yard. The cement and aggregates shall be thoroughly dry-mixed with no water added to them except as may be specifically directed and instructed by the Owner at the time and site of placement.

2.05 Concrete

- A. Concrete for thrust blocking, concrete encasement, and concrete retards (or pipe collars).
 - 1. Concrete shall be of portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be ready-mixed, or transit-mixed concrete produced by a plant acceptable to the Engineer. All

constituents, including admixture, shall be batched at the central batch plant.

2. Reinforced concrete shall conform to ACI specification 318.
3. The following limiting strengths, water contents and cement factors shall apply.

Minimum Comp. Strength (psi at 28 days)	Maximum Water Content* (gals./100 lbs.)	Net Minimum Cement Factor** (100 lbs./c.y.)
2500	7.5	4.5

* Maximum: decrease if possible. This represents total water in mix at time of mixing, including free water on aggregates and water in admixture solution.

** Minimum: increase as necessary to meet other requirements. These cement factors apply to "controlled" concrete subject to specific inspection.

4. Minimum cement content or combined cement plus fly ash content when fly ash is used for performance and longevity shall be as shown in Table A. The Contractor shall increase cement content or the combined cement plus fly ash content, when fly ash is used, as required to meet strength requirements. The amount of fly ash used shall not exceed 25 percent or be less than 15 percent of the total weight of fly ash plus cement.
5. When high early-strength portland cement is permitted, the same strength requirements shall apply except that the indicated strengths shall be attained at seven (7) days instead of twenty-eight (28) days.
6. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Owner may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
7. If, during the progress of the work, the Contractor desires to use materials other than those accepted (originally), or if the materials from the sources originally accepted change in characteristics, the Contractor shall, at his expense, have made new acceptance tests of aggregates and establishment of new basic mixtures by the acceptable testing laboratory being employed on the work.

8. Consistency of the concrete as measured by the ASTM Designation C143 shall be 1 to 4 inches slump.
9. Concrete shall be of such consistency and mix composition that it can be readily worked into the corners and angles of the forms and around the reinforcement, inserts, and wall castings without permitting materials to segregate or free water to collect on the surface, due consideration being given to the methods of placing and compacting.
10. The entrained air, as measured by the Pressure Method, ASTM C231, shall be 3.5% - 5.0%.
11. Cement for all cast-in-place concrete shall be a domestic portland cement ASTM C150 Type I mixed with fly ash free from injurious water soluble salts or alkalies. High early strength cement may only be used with written approval of the Owner. Air entraining cements shall not be used. Cement brands shall be subject to approval of the Owner
12. For slab on grade, one set of concrete samples will be required. For buildings, one set of samples will be required for the walls & slab.

12. Aggregates

- a. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C33, and the following detailed requirements:

Sieve	Percent Passing
3/8 in.	0
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10
Fineness Module	2.60-3.00
Organic	See Plate 2, ASTM C33
Silt	2.0% maximum
Mortar Strength	95% minimum as per ASTM C87 Section 10
Soundness	8% maximum loss, using magnesium sulfate, subjected to 5 cycles

- b. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C343 and the following detailed requirements.

Sieve	Retained
Organic	See Plate 1, per ASTM C33
Silt	1.0% maximum
Soundness	8% maximum loss, using magnesium sulfate, subjected to 5 cycles

- c. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-in. for plain concrete

1-in. for reinforced sections 10-in and over in thickness

3/4-in. for reinforced sections less than 10-in. thickness

The "Designated Size" and the corresponding gradations shown represent the end or combined gradation of the coarse aggregate to be used in the final concrete.

13. Water

- a. Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter, or other deleterious substances.

PART 3: EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILLING

- A. Trench Depth. This Section applies to all trenches. For trenches greater than 5 feet deep refer to Section 01665 - TRENCH SAFETY SYSTEM for special trench safety requirements. Depth of trench as used herein means from natural ground at the highest side of the trench to bottom of trench.
- B. Excavation for all trenches required for the installation of pipes and ducts shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches, for bracing and supporting, and for pumping and drainage facilities and the bottom of the excavations shall be firm and dry and in all respects acceptable to the Owner.
- C. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with sand as shown on the plans.

- D. After the bedding and haunching has been placed, the initial backfill shall be placed to a depth of six inches over the top of the pipe. Backfill shall be thoroughly compacted by hand-tamping as placed with at least one man tamping for each man shoveling material into the trench.
- E. Where the pipes are laid cross country, the remainder of the trench shall be filled with backfill in layers not to exceed eight inches and thoroughly compacted by rolling, ramming or puddling, as the Owner may direct, sufficiently to prevent subsequent settling. Wherever a loam or gravel surface exists prior to cross country excavations, it shall be removed, conserved, and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition. If the Contractor prefers not to store loam or topsoil he shall replace it with loam or topsoil of equal quality and in equal quantity. The surface of the backfilled trench shall be restored to match the previous existing conditions. This shall include final grading, placement of topsoil and seeding, placement of sod (such as at homes or businesses that had maintained lawns), or other unprepared and prepared surfaces. Trenches in alleys actively being used by vehicles (such as trash pickup, vehicle parking, etc.) shall be restored by grading and compacting to 90% or higher with a minimum of 4 inches of flexbase materials for the entire width of the alley. Alleys not actively used by vehicles shall be graded and compacted to 90% or higher, then spread grass seed for entire width of the alley.
- F. Where the pipes are laid in streets, or other existing or proposed paved areas, the last 12 inches of the trench shall be backfilled with Type F, Grade 3 caliche in 6 inch layers thoroughly compacted to 95% of maximum dry density as determined by TxDOT, TEX-113-E
- G. Longitudinal thrust along pipeline of bends, tees, reducers, and caps or plugs shall be counteracted by thrust blocking as shown on the Drawings. Where the bends are in a vertical plane, the thrust shall be counteracted by enough weight of concrete, or lengths of restrained joints to counterbalance the vertical thrust forces. Where undisturbed trench walls are not available for thrust blocking, the Contractor shall furnish and install suitable pipe harnesses, ties, or other joint restraint designed and manufactured specifically for this purpose. Harnesses, ties and/or joint restraints (Mega-Lugs) ties shall be approved by the Owner.
- H. Joints shall be protected by felt roofing paper prior to placing concrete.
- L. Bearing area of thrust blocks shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the Drawings.

3.02 SETTLEMENT REPAIRS

- A. Where a trench has been improperly backfilled, or where settlement occurs, the identified section shall be excavated to the depth and length required, then refilled and compacted to the grade and compaction.

3.03 DISPOSAL OF EXCAVATED MATERIALS

Any excess excavated material, not utilized after all fill requirements have been met, shall become the responsibility of the Contractor. He shall dispose of it by hauling and wasting outside the limits of the right-of-way of this project and of public thoroughfares and water courses, in conformity with pertinent City, County, State and Federal codes and ordinances and in a manner meeting the approval of the Engineer.

3.04 MEASUREMENT

- A. Excavation, Trenching and Backfill will not be measured for payment.

3.05 PAYMENT

- A. No direct payment shall be made for incidental costs associated with excavation, trenching and backfilling for water mains and sanitary sewers, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.
- B. The OWNER will make payments on concrete samples. In the case of a failure, the Contractor will be responsible for successive testing.

END OF SECTION

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SECTION 02444

CHAIN LINK FENCE AND GATES

PART 1: GENERAL

1.01 DESCRIPTION

- A. Fence overall height shall be as shown on the plans or as required to match existing fencing. The fabric shall be composed of individual wire pickets which are helically wound and interwoven in the form of a continuous chain link fabric having a 2-inch square mesh. The top edge of the fabric shall be twisted and barbed, the bottom barbs to clear existing and/or proposed finished grade 2-inch, plus or minus 1-inch.

PART 2: PRODUCTS

2.01 WIRE FABRIC

- A. Fabric shall be woven of No. 9 gauge steel wire and shall be zinc coated by hot-dipped-galvanizing after weaving. Minimum tensile strength of wire pickets shall be 80,000 psi (551,520 Kpa) based on the coated wire diameter. The zinc coating shall be smooth, of reasonably uniform thickness, free from dross, uncoated spots and adhering particles of foreign material. Fabric shall meet the requirements of ASTM Designation A 392. Aluminum coated fabric meeting ASTM Designation A 491 is acceptable.
- B. The weight of the coating per square foot of uncoated wire surface shall be not less than 1.2, as specified for Class II galvanizing. Aluminum coating shall conform to Class II, ASTM Designation A 491.

2.02 POSTS

- A. All tubular members, posts, rails or braces shall be hot-dip galvanized welded or seamless steel pipe.
- B. All posts and post settings shall conform to the following table:

Type	O.D. (in)	Weight (lbs/ft)	Embedment in Concrete (in)	Maximum Spacing (ft)
Line Post	2.5	3.117	28	10
Terminal Post	3.0	4.64	34	10
Gate Post	4.0	9.11	42	13

Top Rail	1.75	1.836
Braces	1.75	1.836

2.03 TOPS

- A. All posts not having extension arms shall be fitted with heavy hot-dipped galvanized iron or aluminum tops with acorn design. Base of tops shall carry a flange around outside of posts.

2.04 EXTENSION ARMS

- A. All extension arms shall be of 14 gauge or thicker pressed steel, hot-dipped galvanized, and shall be made as a unit with the post fittings. All terminal posts shall be fitted with heavy malleable iron or welded steel arms. All posts shall carry three strands of barbed wire, of which the topmost strand shall be 12-inches above the fabric. The barbed wire shall be fastened in slots by using heavy galvanized wire pins. Pins shall be bent and crimped to prevent their being readily removable. Extension arms shall be of sufficient strength to support 280 lbs. (158.8 kg) suspended from the arm tip without bending.

2.05 TOP RAIL

- A. The top rail shall pass through the base of the post top fittings to form a continuous brace from end to end of each stretch of fence. Outside sleeve type couplings, not less than 6-inches in length, 14 gauge or thicker, shall be used in the top rail. Suitable 12 gauge or thicker pressed steel, or malleable iron connections, shall be used to fasten rails securely to all terminal posts.

2.06 CONCRETE

- A. All concrete used in chain link fence construction shall develop a 28-day minimum compressive strength of 2,500 psi. The concrete shall be of such consistency that it will slide, not flow, into place.

2.07 BRACES

- A. Each brace shall be diagonally trussed with a 3/8-inch round galvanized rod with adjustable 1-inch x3/8-inch truss tightener. The braces shall be horizontal and shall be spaced midway between top rail and ground, and shall extend to the first line post. Braces and truss rods shall be complete with all necessary heavy duty fittings. Corner, angle, and pull posts shall be braced in each direction.

2.08 BARBED WIRE

- A. Three strands of four point steel barb wire shall be installed on each arm. Each strand shall be composed of two (2) No. 12-1/2 gauge copper-steel wires with

barbs not to exceed 5-inches centers and shall be hot-dipped galvanized after weaving. Wire having aluminized coating and barbs is acceptable.

2.09 TENSION WIRE

- A. Not less than No. 7 gauge, steel galvanized wire shall be installed along the bottom of the fence and fastened with rings on 24-inch centers.

2.10 FABRIC BANDS

- A. Fabric shall be fastened to the line posts with galvanized fabric bands spaced approximately 14-inches apart, and to top rail, braces, and tension wire at not more than 24-inch spacings. Fabric bands shall be not less than 11 gauge galvanized steel wire.

2.11 STRETCHER BARS

- A. Stretcher bars shall be of 3/4-inch x 3/16-inch flat hot-dipped galvanized steel.

2.12 STRETCHER BAR BANDS

- A. Each stretch of fence shall be secured to terminal posts by means of 7/8-inch x 12 gauge stretcher bands using galvanized bolted stretcher bar bands spaced approximately 14-inches apart.

2.14 GATES

- A. Gates shall be single or double swing and of the size shown on the plans. Gate frames shall be constructed entirely of 2.0" O.D. hot-dipped galvanized pipe weighing not less than 2.72 pounds per linear foot.
- B. Gate end members shall extend above the gate frame to carry the barbed wire guard and have tops to match gate post tops. Barbed wire shall be secured to end members with tension bands. Fabric and barbed wire shall be the same as specified for the fence construction. Each gate frame shall have one center vertical brace and two 3/8-inch galvanized, adjustable truss rods providing double-diagonal trussing.
- C. Gate frames constructed by welding shall be hot-dipped galvanized after fabrication. All welded joints shall be continuous seal welds and cleaned prior to galvanizing.
- D. If gate frames are constructed using fittings, fittings shall be extra heavy malleable iron, hot-dipped galvanized.

- E. Gates shall be complete with approved offset type or double action hinges allowing gates to swing back parallel with line of fence. Hinges shall be made of malleable iron and forgings.
- F. Gates shall be equipped with plunger type drop rod assembly securely bolted to frame, built to engage a gate stop and catch for plunger; stop and catch shall be well anchored in concrete base. Means for readily locking gate latch with padlock shall be provided.
- G. Gates opening size as specified on the plans shall be the clear opening distance when the gate frames are in full open position and held by the keepers.

PART 3: EXECUTION

3.01 CONSTRUCTION METHODS

- A. Post intervals spacing shall conform to those dimensions shown in Paragraph 2.02 or as field conditions require.
- B. Before placing concrete, moisten surfaces of all post holes. Rod thoroughly or vibrate the fresh concrete after placing. Finish smoothly, crowning tops of post holes. Cure concrete by keeping the exposed surface wet for three days, or use a white pigmented curing compound conforming to ASTM Designation C 309.
- C. All posts shall be set plumb and to line in the center of a minimum 9" diameter post hole which extends 8-inches below the bottom of the post.

Pull posts shall be installed at changes of fence grade equal to 15% or more.

END OF SECTION

SECTION 02510

ROADWAYS AND PAVING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to complete the bituminous paved roadways and parking areas, as shown and/or specified herein.

1.02 RELATED WORK NOT INCLUDED

- A. Site preparation is included in Section 02100.
- B. Site grading is included in Section 02485.

1.03 SPECIFICATIONS

- A. Except as otherwise specified herein, the materials and construction shall be in accordance with the Texas State Department of Highways and Public Transportation 1982 Standard Specifications for Construction of Highways, Streets and Bridges, including all addenda.

PART 2: PRODUCTS

2.01 MATERIALS

- A. The new flexible base courses for this project as specified in the proposal Compacted Caliche Base as detailed on the plans or these specifications utilizing Type F Grade 3 caliche as per THD specifications.
- B. All finished Caliche Base surfaces will be primed with MC-1 at a rate of 0.20 gallons per square yard.
- C. All "Hot-Mix" surfaces will be preceded by an application of RC- 2, tack coat, at a rate not to exceed 0.10 gallons per square yard.
- D. Bituminous concrete paving shall be Type "D" (Fine Graded Surface Course), as specified in Item 340 of the above referenced Specifications. The composition shall be as follows:

Percentage
Aggregate by

Standard Sieve	Weight or Volume
Passing 1/2 inch Sieve	100
Passing 3/8 inch Sieve	85 - 100
Passing 3/8 inch Sieve, retained on No. 4 Sieve	21 - 53
Passing No. 4 Sieve, retained on No. 10 Sieve	11 - 32
Total retained on No. 10 Sieve	54 - 74
Passing No. 10 Sieve, retained on No. 40 Sieve	6 - 32
Passing No. 40 Sieve, retained on No. 80 Sieve	4 - 27
Passing No. 80 Sieve, retained on No. 200 Sieve	3 - 27
Passing No. 200 Sieve	1 - 8

The asphaltic material shall form from 4 to 8 percent of the mixture by weight, or from 9 to 19 percent of the mixture by volume.

PART 3: EXECUTION

3.01 INSTALLATION

- A. The Contractor shall install full width street paving and parking areas as detailed on the Drawings.
 1. The base course material, construction methods, compaction equipment, and appurtenances of the pavement base course shall be in accordance with Item 248, Flexible Base, of the above referenced Specifications. The base course shall be the thickness as shown on the Drawings, placed in two layers, not to exceed six inches loose fill height, and compacted per Item 248 "Density Control".
 2. The pavement shall consist of 1-1/2 inch wearing course. The plant mix bituminous concrete requirements, construction methods, equipment, plant, placing, compaction, and appurtenances shall be in accordance with Item 340 of the above referenced specifications .
 3. Compaction of top course shall be such that the density of each course shall be not less than 95 percent of the density as determined by Test Method TEX-207-F.
- B. The Contractor shall complete trench repaving in existing roadways as detailed on the Drawings.
 1. All new paving for replacement or restoration of existing pavements shall conform with the applicable provisions above. The Contractor shall saw cut existing pavement as directed. The top of the trench shall be refilled with 18 inches of crushed stone compacted in two 9-inch layers.

2. No permanent pavement shall be placed over a backfilled trench within 90 days after completion of the backfilling unless permitted to do so in writing by the Engineer. Repaving may be delayed for a longer time if the Engineer so directs.
 3. The Contractor will be required to hose clean all road surfaces after backfilling and before any surfacing, but in no case will pavement be placed until the trench material is dry.
 4. Permanent pavement shall be Type "D", Hot Mix Asphaltic Concrete, laid in one course as specified above. The pavement shall be laid over a prepared subbase, thoroughly compacted and shaped to the required grade and cross-section, and the edge of old pavement trimmed to a smooth line.
 5. Immediately prior to laying the wearing courses, the trimmed edges shall be stable and unyielding, free of loose or broken pieces, and all edges shall be thoroughly broomed and coated with an approved asphalt tack coat. Broom and tack coat course prior to placing wearing course.
- C. The Contractor shall maintain pavement under this Contract during the guarantee period of one year and shall promptly (within three days of notice given by Engineer or Owner) refill and repave areas which have settled or are otherwise unsatisfactory for traffic.

END OF SECTION

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SECTION 03000

CONCRETE

PART 1: GENERAL

1.01 SCOPE:

- A. This section covers the requirements for concrete, reinforcing steel and related materials and methods for the construction of reinforced concrete structures and facilities shown on the Drawings.

1.02 STANDARDS

- A. Concrete for the particular facilities or elements within the project shall have not less than the compressive strengths shown on the Drawings. If none are shown, the 28-day compressive strength shall be not less than 3,000 pounds per square inch.

1.03 SUBMITTALS

- A. The Contractor shall furnish at his own expense, concrete mix designs to the Engineer for review and approval before any pours are made; however, this approval does not in any way relieve the Contractor of his responsibility for the concrete attaining the required strengths. The Owner reserves the right to have concrete test cylinders made during each monolithic pour at his own expense. If the tests reveal that adequate strength is not attained, the Contractor will be responsible not only for the testing cost but also for any required remedial work. He must also provide a new mix design.

PART 2: PRODUCTS

2.01 CEMENT

- A. Cement shall be Portland cement Type 1 conforming to the requirements of the ASTM-C150. Cement which has become damp, lumpy or otherwise affected so as to reduce its strength shall not be used in the work.

2.02 FINE AGGREGATE

- A. Refined aggregates in the concrete shall consist of a sand or a mixture of sand not more than 50% of stone screenings. The sand or mixture of sand and fine aggregate shall consist of clean, hard, durable, uncoated grains, free from lumps.

- B. Stone screenings shall consist of a clean, hard, durable, uncoated fragments resulting from the crushing of stone.
- C. The maximum amount of deleterious substances shall not exceed the following percentages by weight;

Materials removed by decantation-----3%

Clay lumps-----0.5%

Other deleterious substances such as coal, shale,
coated grains, and soft flaky particles----- 2%

and shall be free from a harmful excess of salt or alkali. An additional two (2%) percent loss by decantation will be allowed provided this additional loss is of materials of the same quality as specified for fine or coarse aggregate or mineral filler.

- D. When subjected to the color test for organic impurities, the sand or mixture of sands and stone screenings shall not show a color darker than the standard color.
- E. Except as hereinafter provided, the fine aggregates shall be graded by sieve analysis within the following limits:

SIEVE	PERCENTAGE 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	2 - 10

The minimum percentage shown above for materials passing the No. 50 and No. 100 sieves may be reduced to 5 and 0 respectively if the aggregate is to be used in concrete containing more than 5-1/2 sacks of cement per cubic yard.

- F. The fine aggregate shall have more than 45% retained between any two than 2.45 nor more than 3.0

2.03 COARSE AGGREGATE

- A. Coarse aggregate shall normally consist of crushed stone, gravel, crushed gravel, or a combination of these. Where lightweight structural concrete is indicated on the plans, aggregate shall consist of an expanded clay or shale.
- B. Gravel and crushed gravel shall consist of clean, hard, durable particles free from adherent coatings, thin or elongated pieces, soft or disintegrated particles, dirt, organic or injurious matter.
- C. Crushed stone shall consist of the clean, dustless product resulting from crushing stone. There shall be no adherent coatings, clay, loam, organic or injurious matter. Coarse aggregate shall have a percent of wear of not more than forty-five (45).
- D. The maximum amount of deleterious substances shall not exceed the following percentages by weight:

Material removed by decantation ----- 1.0%

Shale, slate or other similar materials ----- 1.0%

Clay lumps ----- 0.5%

Soft fragments ----- 3.0%

Other deleterious substances including friable,
thin, elongated or laminated pieces ----- 3.0%

The sum of all deleterious substances, exclusive
of material removed by decantation, shall not
exceed by weight ----- 5.0%

and shall be free from harmful excess of salt, alkali, vegetable or other objectionable matter occurring free or as adherent coatings.

- E. The maximum size aggregate shall not exceed 1-1/2" and shall be reduced in size to meet the following conditions:
 - 1. One-sixth (1/6) of the least dimension between forms of that part of the structure in which the concrete is to be placed, and
 - 2. Three-fourths (3/4) of the clear space between reinforcement.

2.04 WATER

- A. Water for use in concrete shall be reasonably clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

Water which is suitable for drinking or ordinary household uses may be accepted for use with the cement without being tested.

- B. If the water is of questionable quality, it shall be tested in accordance with the current standard, "Method of Test for Quality of Water to be used in Concrete", AASHTO Designation T-26.

2.05 ADMIXTURES

- A. Concrete which will be subject to potentially destructive exposure (other than wear or loading) such as freezing and thawing, severe weather or chemicals shall contain entrained air as indicated in the following table. For any such concrete, the water-cement ratio shall not exceed 6 gallons per sack of cement.

Nominal Maximum Size of Coarse Aggregate, Inches	Total Air Content, Percent by Volume
3/8 -----	6 to 10
1/2 -----	5 to 9
3/4 -----	4 to 8
1 -----	3.5 to 6.5
1-1/2 -----	3 to 6
2 -----	2.5 to 5.5
2-1/2 -----	1.5 to 4.5

- B. If required or permitted, an approved accelerator may be used in the proportions recommended by the manufacturer when the temperature of the concrete as placed is less than 40o F.(not to exceed 2% of calcium chloride by weight of cement). Detailed recommendations for use of calcium chloride in cold weather are given in "Recommended Practice for Cold Weather Concreting:(ACI 306).

2.06 REINFORCING STEEL

- A. Steel reinforcement shall conform to the Standard Specification for Deformed Billet Steel Bars for concrete reinforcement, ASTM Designation A 615, Grade 40 or 60 unless otherwise noted on the Drawings.

3.04 BATCHING:

- A. The limits and ranges shown in Table "A" below shall be conformed with:
- B. In the event of a change of the source of the aggregates during construction the Contractor shall notify the Engineer at least three (3) days in advance of the

proposed changes and at such time furnish samples of aggregate from the new source for testing purposes.

- C. The maximum quantity of water per 94 pounds of cement as specified shall include the free water in aggregates not including moisture absorbed by the aggregates. The slump range indicated in Table "A" is intended as a guide to the Contractor.
- D. In proportioning the mix and establishing the permissible slump, the Contractor will make allowances for the water-reducing potential of the admixture used in the concrete and to the use of high frequency mechanical vibration for compacting the concrete.
- E. Materials shall be measured by weighing, except as otherwise specified or where other methods are specifically-authorized. When cement is measured by weight it shall be weighed on a scale separate from those used for other materials. Each size of aggregate shall be weighed separately.
- F. The mixing water shall be measured by volume or weight. The device for the measurement of water shall be readily adjustable.
- G. All measuring devices shall be subject to approval of the Engineer. Scales for weighing aggregates or cement may be either the beam or springless dial type and shall be accurate within one (1%) percent under operating conditions. Adequate standard test weights shall be available for checking accuracy. All exposed devices, fulcrums and similar working parts of the scales shall be kept clean. When beam type scales are used, provision shall be made for indicating to the operator that the required load in the weighing hopper is being approached; the device shall be in full view of the operator while charging the hopper and he shall have convenient access to all controls.

PART 3: EXECUTION

3.01 MIXING AND DELIVERY:

- A. Ready mixed concrete shall be mixed and delivered to the required point on the job site, by means of one of the following combinations of operation:
 - 1. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitator or truck mixer operating at agitating speed.
 - 2. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer ("Shrink-mixed"). Mixed completely in a truck mixer ("Transit mixed").

- B. Mixers and agitators shall be operated within the limits of capacity and speed of rotation designated by the manufacturer of the equipment.
- C. When a stationary mixer is used for the complete mixing of the concrete, the mixing time for mixtures having capacities of 1 cubic yard or less shall not be less than 2 minutes. For mixtures of larger capacities this maximum shall be increased 30 seconds for each cubic yard, or fraction thereof, for additional capacity. Mixing time shall be measured from the time all cement and aggregate are in the drum. The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregate and all water will be in the drum by the end of the first 1/4 Of the specified mixing time.
- D. When a stationary mixer is used for the partial mixing of the concrete (shrink-mixing), the mixing time in the stationary mixer may be reduced to the minimum required (about 30 seconds) to intermingle the ingredients. Mixing shall be completed in a truck mixer by not less than 50 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as mixing speed. Additional mixing, if required by the Engineer, shall be at the-speed designated by the manufacturer of the equipment as agitating speed.
- E. When the concrete is mixed in a truck mixer loaded to its rated capacity, the number of revolutions of the drum or blades at mixing speed shall not be less than 50 nor more than 100. If the volume of the batch is greater than the rated capacity, but not greater than that guaranteed by the manufacturer, the number of evolutions of the drum or blades at mixing speed shall not be less than 70 nor more than 100. All revolutions after, 100 shall be at agitating speed.
- F. When a truck mixer or agitator is used for transporting concrete that has been completely mixed in a stationary mixer, mixing during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed.
- G. When a truck mixer or agitator is used for transporting concrete, all concrete not placed in the work within 30 minutes after addition of water to the batch shall be rejected and disposed of by the Contractor at his own cost and expense.
When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall begin within 30 minutes after the cement has been intermingled with the aggregate.
- H. The production and delivery of ready mixed concrete shall be such that will provide a continuous finishing operation and in no case more than 20 minutes shall elapse between the depositing of successive batches of concrete in any monolithic unit. When truck mixers or agitators are used for transporting the concrete, all water used for washing the drum after it has been emptied, shall be discharged before the drum is again loaded.

3.02 SLUMP TEST

- A. Slump tests of concrete delivered to the work for placement may be made at any time when the Engineer determines such tests are justified and necessary.
- B. If the measured slump falls outside the limits specified, a check test shall be second failure, the Engineer may refuse to permit the use of the load or batch of concrete represented.

3.03 COLD WEATHER REQUIREMENTS

- A. Concrete shall not be mixed and delivered for placement on the job, without the approval of the Engineer, when the air temperature is at or below 40° F and falling.
- B. When permission is given for delivery and placement of concrete when the outdoor temperature is lower than 40°F., the concrete shall arrive at the site of the work having a temperature of not less than 60°F. nor more than 90°F.
- C. The Contractor shall take adequate precautionary measures to prevent freshly placed concrete from freezing. Frozen concrete will be rejected and shall be removed and replaced at the Contractor's expense.
- D. More detailed recommendations are given in "Recommended Practice for Winter Concreting" (ACI-306).
- E. To maintain the temperature of the concrete above the minimum placing temperature required by the section entitled "Placing Temperatures," as mixed temperature shall not be less than 55°F. when the mean temperature falls below 40°F.
- F. If the water or aggregate has been heated, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be added to mixtures water and aggregate when the temperature of the mixer is greater than 100°F.

3.04 HOT WEATHER REQUIREMENTS

- A. Detailed Recommendations are given in "Recommended Practice for Hot Weather Concreting" (ACI*-305 and ACI-223). The ingredients shall be cooled before mixing, or well crushed ice may be substituted for all or part of the mixing water if, due to high temperature, any difficulties described in the Section entitled "Placing Temperatures" are encountered.
- B. Concrete with a temperature of 85°F and below shall have maximum mixing time of 1 1/2 hours. The maximum mixing time of concrete with a temperature

of 85°F to 90°F shall be one hour. No concrete with a temperature above 90°F shall be placed without permission of the engineer.

3.05 FORMING:

- A. The forms shall be suitable for the work and shall conform to the shape, lines and dimensions of the structure to be built as shown on the Drawings.
- B. For all surfaces which are exposed in the finished work, forms shall be of steel, metal surfaces on wood, plywood, pressboard, or well seasoned boards, dressed all over and smooth. They shall be so built that when removed, the concrete will be left free from offsets, fins, ridges, or other unsightly defects.
- C. Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of Section 203.1, "Recommended Practice for Concrete Formwork" (ACI-347). Forms shall be sufficiently tight to prevent leakage of mortar. The size and spacing of studs and wales shall be determined by the nature of the work and the height to which concrete is placed. Joints shall be snug, and shall occur at the designated locations only.
- D. All forms shall be cleaned and inspected immediately prior to placing concrete. Deformed broken, or defective forms shall be removed from the work. Temporary openings shall be provided where necessary to facilitate cleaning and inspection just prior to placing concrete.
- E. Should the forms show any sign of yielding, spreading or otherwise becoming displaced from correct alignment or position during or after the placing of concrete, they shall be corrected immediately by adjustment or bracing to the extent necessary, or, if required, shall be removed in part or in their entirety and rebuilt or reset.
- F. The entire inside surfaces of forms shall be oiled with an approved form oil, or shall be thoroughly wetted Just prior to placing concrete.
- G. All exposed corners and edges shall have a formed 3/4 inch chamfer unless otherwise indicated on the plans.
- H. Wooden forms for surfaces not exposed to view may be built of sound No. 1 yellow pine, Douglas fir, or equivalent acceptable lumber, dressed on all sides and neatly fitted. Matched lumber, shiplap, or other satisfactory joint lumber shall be used throughout, and tongued and grooved material shall be used where required.
- I. The sheeting shall be erected in level random courses. All vertical joints shall be squared, and all horizontal joints shall be level and matched throughout the entire job. Except for panel forms, vertical joints shall not exceed the width of

one board and shall be staggered at least thirty-two (32) inches and made on the center of a stud. Inside forms shall not be placed until exterior forms have been checked, or vice versa.

- J. Forms for beam and girder soffits shall be constructed with nominal 2-inch lumber, and all joints shall be tight and even. Beam and girder soffits shall be sufficiently braced shored and wedged to prevent deflection.
- K. Forms for all interior exposed concrete surfaces and designated areas of exterior exposed concrete surfaces shall be constructed with minimum thickness 5/8 inch plywood for straight sections. and 3/8 inch plywood for curved sections. Plywood shall be made with a waterproof glue and manufactured especially for concrete form work. Edges shall match in thickness, width, and length. Full size sheets of plywood shall be used, except where otherwise required or where smaller pieces will cover an entire area. Forms shall be placed so that markings will be symmetrical. Plywood shall be thoroughly oiled on contact faces and edges with raw linseed oil or other approved form lacquer. Surplus oil shall be wiped off forms before reinforcing steel is placed and while the surfaces accessible.
- L. If steel forms are proposed, they shall be approved prior to use. The forms shall be accurately constructed in a standard size and in such minor multiple widths and lengths as will permit plates and fillers to be erected to correct curves, as required. Steel forms shall be coated before each use, with a light, clear, parafin-base oil, or other acceptable commercial preparations which will not discolor the concrete. Plates shall be wire brushed after each use.
- M. Voids below grade beams, walls, and slabs shall be closed by a monolithic extension of the concrete member at its edges, or by precast concrete blocks which extend at least 6" into the subgrade to retain the adjacent soil.
- N. Only form ties, hangers, and clamps approved by the Engineer shall be used, and they shall be of such type that no metal will be closer than one-half (1/2") inch from the surface. Wire ties will not be permitted. Lugs, cones, washers, or other devices which will leave holes or depressions at the surface of the concrete greater than 7/8" diameter shall not be fitted within the forms. The spacing of form ties, hangers, and clamps shall be strictly in accordance with manufacturer's directions.
- O. In general, forms shall not be removed until the concrete has hardened sufficiently to support its own load safely plus any superimposed loads that might be placed thereon. In any event, forms shall be left in place at least the minimum required length of time specified below, after the date of placing concrete:

Columns ----- 2 days

Side forms for girders & beams ----- 2 days

Bottom forms of slabs ----- 7 days

Bottom forms of beams & girders ----- 7 days

Walls ----- 2 days

- P. The removable portion of form ties shall be withdrawn from the concrete immediately after taking down the forms. The holes left by such ties shall be filled with grout and the surface shall be finished with a steel spatula or rubbed with sack cloth.
- Q. Care shall be taken in removing forms, wales, shorings, supports, and the form ties to avoid spalling or marring the concrete. The required rubbed finish and such patching as may be necessary shall be started within one (1) day after removal of the forms.

3.06 PLACING OF CONCRETE:

- A. Concrete shall not be deposited in any form until it is complete for that unit of the work with all steel reinforcement in place all debris and extraneous material removed, and has been inspected and approved by the Engineer.
- B. Before placing of concrete in any portion of a structure adequate provision shall be made for walkways from which the concrete to be placed can be worked or runways over which the concrete may be transported in buggies, when such are used. Buggy runways shall be clear of all reinforcements. Runways or walkways used for placing or working concrete in walls shall be properly supported and adequate in width for safe use by workmen. Runways shall provide convenient access to the entire length of walk in which concrete is being placed.
- C. The mixed concrete shall be delivered to the subgrade or forms in convenient quantities for placing and that good workmanship will permit. The Contractor shall employ and use as many skilled workmen in placing the concrete as are required to produce a poured structure which is sound in all respects and watertight.
- D. Concrete for pavement shall be placed only on a firm and unyielding subgrade or subbase which is free from all loose material and debris and has been wet down in advance of placing the concrete.

- E. While concrete is being placed adjacent to a joint in which a waterstop is specified, care shall be taken to see that the concrete is properly placed and worked along the joint in which the waterstop is held and that the waterstop itself is in the position specified on the Drawings and is firmly bedded in mortar on all sides.
- F. Concrete shall be handled from the mixer, or the transporting vehicles, to the place of final deposit by methods which will prevent any loss or separation of the ingredients. When the concrete is being deposited in wall sections it shall be placed as nearly as possible to its final position. The concrete shall be so placed as to maintain, until the completion of the unit being poured, a plastic and approximately level horizontal surface. No concrete shall be deposited in water, and free falls in excess of five (5) feet will not be permitted.
- G. The concrete comprising each section of wall between Joints shall be deposited continuously in layers of such thickness that none will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section.
- H. Concrete shall, during and immediately after depositing be compacted by high frequency internal vibrators. The vibrators shall not be attached to the forms or held against the forms or reinforcement, and shall be handled by workmen skilled, in their efficient use. The number of vibrators required to secure uniform and maximum consolidation of the concrete without segregation shall be used.
- I. Before depositing new concrete on or against concrete which has hardened, the roughened surface of the hardened concrete shall be thoroughly cleaned of loose aggregates, damaged or loose hardened concrete, or laitance of any foreign material.
- J. To insure an excess of mortar at the horizontal junction of hardened and newly deposited concrete, the cleaned surface of the old concrete shall first be covered with a cement mortar bed, not more than ¹/₂ inch thick, of the same or greater strength as that used in the concrete.

3.07 CURING OF CONCRETE:

- A. All concrete surfaces normally exposed to the atmosphere shall be protected against too rapid drying by curing for a minimum period of seven (7) days.
- B. Concrete shall be either cured by keeping continuously wet with water for the above specified periods or the exposed surfaces of the fresh concrete may be sealed with an approved curing compound which will minimize the escape of moisture from within the concrete.

- C. Concrete being cured shall be wet down as often as is necessary to keep it continually wet. Vertical surfaces shall be protected from too rapid drying by being covered with burlap or other suitable blanket material kept continuously wet for a period of 7 days.
- D. Membrane curing shall be accomplished by coating the entire exposed surface of the concrete with a liquid compound applied uniformly by means of an approved pressure spray distributor, at the rate of 200 square feet per gallon of material. To prevent waste or pooling, the required application may be secured by more than one coat.
- E. Curing compound shall be of a nature and composition not deleterious to concrete, thinned to a working consistency either with a volatile solvent or by emulsification with water. The curing compound shall be of standard and uniform quality and shall be ready to use as shipped by the manufacturer. No diluting shall be permitted.
- F. It shall form a membrane which will adhere to moist concrete and which will not disintegrate, check, peel from the surface, nor show signs of such deterioration within thirty (30) days after application, under actual weather and working conditions.
- G. The compound shall, when tested in accordance with the method of test for "Water Retention Efficiency of Methods for Curing Concrete", ASTM C156, be effective in limiting the water loss in the concrete test specimen to 3-1/2 percent when applied at the rate of coverage recommended by the manufacturer.
- H. Where it is necessary to block out an opening in a concrete wall or slab to accommodate fittings the forms used in making the opening shall include a keyway on all facings. The space between the pipe or fitting and the concrete shall be thoroughly cleaned and filled with a non-shrink grout or mortar which will preserve watertight integrity.

3.8 FINISH OF CONCRETE SURFACES:

- A. The provisions of this subsection shall apply for all exposed exterior concrete surfaces and all interior concrete surfaces of conduits and structures whose finish is not specified elsewhere in these specifications or specifically indicated on the Drawings.
- B. The exposed tops of walls of structures shall be brought to true level, floated to bring a workable grout to the surface, struck off and releveled where necessary with cement grout of the same proportions as the mortar of the concrete. The wall tops shall then be float finished and edged unless otherwise indicated on the Drawings. The edger used shall be of 1/2" radius and shall have its flanges ground to a knife edge so as to have as little burr as possible.

- C. Where not otherwise indicated on the Drawings, the top and bottom slabs of all structures and water carrying conduits shall be finished as follows: The top of the slab shall be screeded to grade and cross section, lightly tamped as required to bring up a good bed of mortar for finishing and re-screeded as necessary. The surface shall then be finished with a wood float and leveling darby. No further finish will be required on top slabs or structures or conduits which are to be buried. All exposed top slabs of structures and conduits shall be given a final wood and brush finish with a smooth surface which conforms with accuracy to required shape, slope and grade. Slabs shall be edged as appropriate.
- D. Concrete paved areas, other than roadways and parking areas shall be given a smooth wood float and brush finish, edged and scored as directed by the Engineer.
- E. All exposed exterior and interior wall surfaces of structures, flumes and conduits, shall be rub-finished as follows:
- F. Surfaces to be rub-finished shall be thoroughly wetted and kept in that condition until the rubbing work for each section is completed. Surfaces shall be rubbed with carborundum blocks and water until any surplus materials have been removed and the surface is uniformly smooth. Grout or mortar shall not be used in the rubbing process and plastering of the surfaces will not be permitted. Rubbing blocks shall be driven by electric or compressed air tools except as hand rubbing is specifically approved by the Engineer. Rubbing of concrete surfaces shall commence within one (1) day after removal of forms.
- G. Interior floors which are to receive no other finish and surfaces beneath asphalt or vinyl tile, shall be given another finish by steel troweling until a dense, smooth and durable surface is developed, and shall be edged and scored as directed by the Engineer. A final finish with a soft-bristle brush to form a slightly abrasive surface will be required where indicated on the plans.

3.09 REINFORCING STEEL:

- A. Reinforcement bars shall be bent cold to the shape indicated on the plans. All bending of hard grade new billet steel bars shall be done in the shop. Bends shall be true to the shapes indicated or required.
- B. Reinforcement shall be stored above the ground surface upon skids, platforms or other supports and shall be protected from mechanical injury and surface deterioration by exposure to the weather. When placed in the work, the reinforcements shall free from dirt, rust, scale, paint, oil, or other foreign material.

- C. The reinforcement for slabs in contact with the ground shall be supported in its proper position, as indicated on the Drawings, by means of precast cement mortar blocks, of approved dimensions, resting on the slabs' subbase. Such precast blocks shall be made of mortar composed of annealed wire cast into each block. The length of the wire loop shall be sufficient to allow the block to be tied to the reinforcement. Blocks shall be spaced at the intervals required to maintain the reinforcement in its required position in the slab during the placing of the concrete. The slab reinforcement shall not be used to support planking or runways used in placing concrete.
- D. In the case of floor slabs, galleries, deck slabs, and beams, metal chairs, spacers and other metal accessories necessary to provide the required clear distances and proper alignment and spacing between bars shall be used subject to the approval of the Engineer.
- E. Steel reinforcement shall be placed and held in position so that the concrete cover, as measured from the surface of the bar shall be as specified in the general notes.

3.10 MEASUREMENT AND PAYMENT:

- A. Unless separate pay items are listed in the Proposal, the price for reinforced concrete used in the Project shall be included in the particular lump sum prices therein to which they most nearly relate. Payment of these lump sum prices will provide complete compensation for mix design; furnishing and placing all materials including reinforcing steel; joint and sealing materials; forming; finishing and curing; preparation of test specimens; protection of finished surfaces; cleanup; labor, tools and equipment and all incidentals necessary to provide reinforced concrete, complete in place.

SECTION 05500

MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to complete and install fabricated metal items. Furnish all supplementary items necessary for their proper installation.
- B. Check Drawings carefully and furnish all anchors, sleeves, bolts, brackets, clips, inserts, angles, loose lintels, tubing, bar stock, plates and other miscellaneous metal not distinctly specified under other sections but necessary to complete the Work.

1.02 REFERENCE STANDARDS

- A. Aluminum Association
 - 1. ASD-1 Aluminum Standards and Data
 - 2. Specifications for Aluminum Structures
- B. American Institute of Steel Construction (AISC)
 - 1. Manual of Steel Construction, Eighth Edition
 - 2. Manual of Steel Construction - Load & Resistance Factor Design, First Edition
- C. American Society for Testing & Materials (ASTM)
 - 1. Standard Specifications as referenced.
- D. American Iron and Steel Institute (AISI)
 - 1. Standard specifications as referenced.
- E. American National Standards Institute (ANSI)
 - 1. Standard specifications as referenced.
- F. American Welding Society (AWS)
 - 1. AWS D1.1 Structural Welding Code - Steel
 - 2. AWS D1.2 Structural Welding Code - Aluminum

3. AWS A2.0 Standard Welding Symbols

G. Steel Structures Painting Council (SSPC)

1. SSPC SP-1 "Solvent Cleaning"
2. SSPC SP-2 "Hand Tool Cleaning"
3. SSPC SP-3 "Power Tool Cleaning"
4. SSPC SP-6 "Commercial Blast Cleaning"
5. SSPC SP-10 "Near-White Blast Cleaning"

1.03 SUBMITTALS

- A. Shop Drawings. Prior to fabrication, submit shop drawings, erection or setting drawings, product data, etc., showing methods of assembly, anchorage and connection to other members. Indicate welded connections in accordance with AWS A2.0. Shop drawings will be required for all items included under this Section.
- B. Samples. Submit samples as requested by the Engineer during the course of construction.

1.04 COORDINATION

- A. Coordinate completely the Work of this Section with the Work of other Sections. Verify at the site both the dimensions and Work of other trades adjoining items of work in this Section before fabrication and installation of the items specified.
- B. Furnish to the pertinent trades all items included under this section that are to be built into the Work of other Sections.

1.05 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.
- B. Delivery anchorage devices with setting drawings, templates and instructions for installation.
- C. Store delivered items off the ground and protected from dirt and weather.
- D. Repair items which have become damaged or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

PART 2 PRODUCTS

2.01 STEEL FABRICATIONS

A. Materials

- | | |
|---|--|
| 1. Structural steel shapes, plates, bars & rods | ASTM A 36 |
| 2. Steel plates - bent or cold formed | ASTM A 283, Grade C |
| 3. Steel sheets | ASTM A 366 |
| 4. Welded and seamless steel pipe | ASTM A 501 or ASTM A 53, Type E or S, Grade B Schedule 40.
Use standard malleable iron fittings, galvanized for exterior work |
| 5. Welded and seamless rectangular steel tubing | ASTM A 500, Grade B |
| 6. Carbon steel bolts and studs, nuts & washers | ASTM A 307, Grade A [hot dip galvanized where noted] |
| 7. High strength bolts, nuts and washers for structural steel | ASTM A 325 [hot-dip galvanized where noted] |
| - elevated temperature exposures | ASTM A 325-Type I |
| - general application | ASTM A 325-Type I or II |
| 8. Welding Materials | AWS D1.1 |
| 9. Galvanizing | |
| a. general | ASTM A 123 |
| b. hardware | ASTM A 153 |
| c. assembled steel products | ASTM A 386 |
| 10. Shop and Touch-up Primer | [SSPC 15] Type I red oxide |

B. Fabrication

1. See general fabrication requirements in Article [2.06].
2. Fabricate miscellaneous steel in accordance with the Drawings. Fabrications include: beams, angles, support brackets, closure angles in roof at edge of T- beam, base plates to support ends of T-beams, splice plates, anchor

bolts (except for equipment furnished in Divisions 11 and 15), and any other miscellaneous steel called for on the Drawings and not otherwise specified.

3. Thoroughly clean steel fabrications of all loose mill scale, rust, grease or oil, moisture, dirt, or other foreign matter and finish in compliance with Article [2.01.C].
 - a. Remove scale, rust and other deleterious materials before shop coat of paint is applied.
 - b. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-6 "Commercial Blast Cleaning".
 - c. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".

C. Finishes

1. Items in areas which are not exposed to weather or moisture, shall have exposed surfaces painted with a shop coat of primer compatible with the finish coatings specified in Division 9, after fabrication but before shipping. Apply two shop coats of primer to surfaces that will be inaccessible after erection.
 - a. Remove scale, rust, and other deleterious material before shop coat of paint is applied. Clean off heavy rust and loose mill scale in accordance with SSPC-2 "Hand Tool Cleaning", or SSPC-3 "Power Tool Cleaning", or SSPC-6 "Commercial Blast Cleaning". Remove oil, grease, and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".
 - b. Immediately after surface preparation, brush or spray on metal primer paint, applied in accordance with manufacturer's instructions and at rate to provide a uniform dry film thickness of 3.0 mils per coat applied. Use painting methods which will result in full coverage of joints, corner, edges and all exposed surfaces.
 - c. As soon as possible after erection, touch up any scraped, abraded or unpainted surfaces using primer as specified for shop coats.
2. Items exposed to weather, submerged in water or subject to splashing, or located in corrosive environments shall be hot dip galvanized after fabrication unless otherwise noted on the Drawings or specified.
 - a. Following all manufacturing operations, items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the batch until their temperature

becomes the same as the bath. Coating shall be not less than 2 ounces per square foot of surface.

- b. Where field welding of galvanized material is necessary, welds shall be wire brushed clean and immediately regalvanized in the field using "Galvalloy" galvanizing stick compound or coating with ZRC zinc coating by the Sealube Company.

2.02 STAINLESS STEEL FABRICATIONS

A. Materials

1. Plates, sheets and structural shapes

- | | |
|---|----------------------|
| - exterior, submerged or industrial use | ASTM A 167, Type 316 |
| - interior and architectural use | ASTM A 167, Type 304 |

2. Bolts, nuts & washers

ASTM A 276, Type 316

B. Fabrication

1. See general fabrication requirements in Article 2.06.

2.03 CAST IRON FABRICATIONS

A. Materials

1. Gray iron castings

ASTM A 48, Class 30.

B. Fabrication

1. See general fabrication requirements in Article 2.06.
2. Provide frames, covers and grates for manholes, catch basins and inlets fabricated from good quality, strong, tough, even grained cast iron. Castings shall be as manufactured by the Neenah Foundry, Mechanics Iron Foundry, or equal. Sizes shall be as shown on the Drawings or specified. Covers shall have letters "WATER", "SEWER" or "DRAIN", as applicable, embossed on top.
3. Provide solid manhole and manhole covers and frames for electrical and telephone underground systems. Covers shall have letters "HIGH VOLTAGE", "LOW VOLTAGE", "SIGNAL", "TELEPHONE", as applicable, embossed on top.

2.04 ALUMINUM FABRICATIONS

A. Aluminum Framing & Fabrications

1. Materials

- a. Aluminum structural shapes and plates. Alloy 6061-T6
- b. Extruded aluminum pipe. Alloy 6063-T6
- c. Fasteners. Stainless Steel ASTM A 276, Type 316

2. Fabrication

- a. See general fabrication requirements in Article 2.06.
- b. Fabricate miscellaneous aluminum shapes and plates as shown. Furnish welded and mitered angle frames and other fabrications complete with welded anchors attached. Furnish all miscellaneous aluminum shown but not otherwise detailed. Structural shapes and extruded items shall comply with the dimensions on the Drawings within the tolerances published by the Aluminum Association.
- c. Weld aluminum work on the unexposed side when possible in order to prevent pitting or discoloration of exposed aluminum surfaces.

3. Finishes

- a. All exposed aluminum surfaces shall have fabricator's standard mill finish unless otherwise specified. Apply a coat of methacrylate lacquer to all aluminum before shipment.

B. Aluminum Nosings for Concrete Stairs

- 1. Acceptable Manufacturers include Wooster Products, Inc. - Type 116 3" wide nosing with 1" nose depth, "Alumogrit" surface, or equal.
- 2. Provide concealed stainless steel integral anchors extending at least 1-1/4 inches below the tread and spaced out more than 12 inches on center. Drilled anchors are not acceptable. Furnish treads with heavy duty protective tape cover.

2.05 ANCHORS, BOLTS, AND FASTENING DEVICES

- A. Furnish anchors, bolts, fasteners, etc., as necessary for installation of the Work of this Section or for securing the Work of other Sections to in-place construction.
- B. Compound masonry anchors shall be of the type shown or required and shall be equal to Star Slug in compounded masonry anchors manufactured by Star Expansion industries, equal by Phillips Drill Co., Rahlplug, or equal. Anchors shall be minimum "Two unit" type.

- C. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Attach aluminum and stainless steel to concrete or masonry by means of stainless steel machine bolts. Attach iron or steel with steel machine bolts unless other-wise specifically noted.
- D. For structural purposes, unless otherwise noted, drilled concrete anchors shall be adhesive capsule type or expansion type anchor bolts.
1. Adhesive capsule anchors shall be a two-part stud and capsule chemical resin anchoring system. Capsules shall be self-contained, exactly proportioned, sealed glass units containing premeasured amounts of resin, aggregates, and hardener. Stud assemblies shall be as indicated on the Drawings and shall include all-thread anchor rod with nut and washer, or deformed reinforcing steel complying with the requirements of Section [03200}. Provide manufacturer's recommended drive units and adapters for installing capsules and studs. Install anchors in full compliance with the manufacturer's recommendations.
- a. Threaded anchor rod assemblies shown on the Drawings shall be manufactured from the following materials:
- | | |
|-----------------------|---|
| i. Standard: | Rod: ASTM A 307, Grade A
Nut: ASTM A 563, Grade A
Washer: ANSI 818.22.1, Type A Plain |
| ii. High Strength: | Rod: ASTM A 193, Grade 87
Nut: ASTM A 563, Grade DH
Washer: ASTM F 436 |
| iii. Stainless steel: | Rod: ASTM F 594 (AISI Type 304)
Nut: ASTM F 594
Washer: AISI 818.22.1, Type A, Plain |
- b. Acceptable manufacturers: Hilti "HVA Adhesive Anchor"
Molly "Parabond Capsule Anchor" or approved equal
2. Expansion Anchors shall be drop-in wedge type anchors of the sizes noted on the Drawings complete with nuts and washers. Unless otherwise noted, provide zinc plated carbon steel anchors. Stainless steel anchors, where required shall be all AISI type 316 construction. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient

a. Acceptable Manufactures: Hilti: "Kwik Bolt"
Molly: "Parabolt"

- ## 2.06 FABRICATION - GENERAL

- A. Form all miscellaneous metal work true to detail, with clean, straight, sharply defined profiles, and smooth surfaces of uniform color and texture. Provide fabrications free from defects impairing strength or durability. Drill or punch holes and smooth edges. Ease exposed edges to a small, uniform radius. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Supply components required for anchorage of fabrications. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.
- C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. Dress the face of welds flush and smooth. Continuously weld and grind smooth welds that will be exposed. Ex-posed joints shall be close fitting and jointed where least conspicuous. Conceal fastenings where practical. Punch or drill for temporary field connections and for attachment of the Work of other trades.
- D. Welding of parts shall be in compliance with the latest edition of the AWS structural welding code for steel (D1.1) or aluminum (D1.2) as appropriate, and shall only be done where shown, specified, or permitted by the Engineer. Welding shall be performed only by welders certified to perform the required welding in compliance with the requirements of the AWS Code. Component Darts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.
- E. Castings shall be of good quality, strong, tough, even-grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Thoroughly clean castings.

Castings may be subjected to a hammer inspection in the field by the Engineer. All finished surfaces shown on the Drawings and/or specified shall be machined to a true plan surface allowing pieces to seat at all points without rocking. Make allowances in the patterns so that thicknesses specified or shown will not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. Provide facilities for weighing castings in the presence of the Engineer and show true weights, certified by the supplier.

- F. Shop painting will not be required for galvanized metal, stainless steel, aluminum, copper, brass and bronze unless specifically specified.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install all items furnished except items to be embedded in concrete which shall be installed under Division 3. Items to be attached to concrete after such work is completed shall be installed in compliance with the details shown. Furnish to appropriate trades all anchors, sockets, or fastenings required for securing Work to other construction.
- B. Set metal work level, true to line, and plumb as indicated.
- C. Weld field connections and grind smooth where practicable. Clean and strip primed, steel items to bare metal where site welding is required. Conceal fastenings where practicable.
- D. Secure metal to wood with lag screws, of adequate size, with appropriate washers.
- E. Touch-up abrasions to finish or primer coatings immediately after erection and prior to both final coating and final acceptance.
- F. Break contact between dissimilar metals as shown on the Drawings or as specified in Article [3.01H].
- G. Field-apply coatings for installation of metal fabrications according to the following schedule. (For embedded items, coat the embed.)
 - 1. All steel surfaces in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in compliance with the manufacturer's instructions prior to installation.

2. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.
3. Where aluminum contacts masonry or concrete, apply a heavy coat of zinc chromate primer to the surface of the aluminum.
4. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

3.02 INSTALLATION - STAIR NOSINGS

- A. Extend nosings to within 4 inches of ends of treads. Set top flush with tread and edge flush with riser. Set nosing anchors into concrete as concrete is poured. Do not remove protective tape until completion of Project.

END OF SECTION

SECTION 09865

SHOP COATING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless and galvanized steels, as specified herein.
- B. It is the intent of these Specifications to shop coat all exposed ferrous metals listed below:
 - 1. Pipe
 - 2. Fittings
 - 3. Valves
 - 4. Pumps

All other work obviously required to be painted unless otherwise specified and minor items not mentioned in the schedule of work, shall be included in the work of this Section where they come within the general intent of the specifications as stated herein.

1.02 RELATED WORK NOT INCLUDED

- A. Field finish painting is included in Section 09900.

1.03 SUBMITTALS

- A. Submit to the Engineer for approval, as provided in Section 01340, shop drawings, manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses.
- B. Submit representative physical samples of the proposed primers, if required by the Engineer.

PART 2: PRODUCTS

2.01 MATERIALS

- A. All painting materials shall be equal to those manufactured by the Tnemec Company, Inc., or the Carboline Company or equal. The painting schedule has been prepared on the basis of Tnemec products (unless otherwise noted) and Tnemec recommendations for application. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following schedule together with sufficient data substantiated by certified tests conducted at no expense to the Owner, to demonstrate its equality to the paint(s) named, is submitted to the Engineer in writing for approval within 30 days after the signing of the Contract Agreement. The type and number of tests performed shall be subject to the Engineer's approval.
- B. All painting materials shall be delivered to the fabrication site in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Engineer's approval before using.
- C. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used.
- D. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.
- E. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations.

2.02 PAINTING SCHEDULE

- A. All colors will be selected by the Engineer based on the color shown herein. The following surfaces shall have the types of paints specified below applied at the minimum dry film thickness (DFT) in mils per coat.
- B. The following types of paints by Tnemec, unless otherwise indicated, have been used as a basis for the paint schedule:
 - 1. Hi-build Epoxoline (Series 66) - Epoxy-Polyamide Coating
 - 2. Versare Primer (Series 4) - Modified Alkyd Rust-Inhibitive Primer
- C. All ferrous metals shall be shop coated according to the following areas of placement:
 - 1. Process
 - a. Submerged 1 Coat Series 66 (4.0-6.0 DFT)
 - b. All Non-Submerged 1 Coat Series 66 (3.0-4.0 DFT)

2. Non-Process

a. 1 Coat Series 4 (2.0-3.0 DFT)

- D. Non-Primed Surfaces - Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.
- E. Compatibility of Coating Systems - Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Section 09900 for use in the field and which are recommended for use together.

PART 3: EXECUTION

A. Surface Preparation and Priming

1. Non-submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Blast Cleaning, immediately prior to priming.
2. Submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC-SP-10, Near White Blast Cleaning, immediately prior to priming.
3. Surfaces shall be dry and free of dust, oil, grease and other foreign material before priming.
4. Shop prime in accordance with approved manufacturer's recommendations.

END OF SECTION

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SECTION 09900

PAINTING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all materials, labor, equipment and incidentals required to perform all painting necessary to complete this contract in its entirety. It is the intent of this Section that all components of the project subject to corrosion be protected.
- B. It is the intent of these Specifications to paint all exposed:
 - 1. Miscellaneous Steel
 - 2. Mechanical Equipment
 - 3. Pipe
 - 4. Fittings
 - 5. Valves

All other work obviously required to be painted unless otherwise specified and minor items not mentioned in the schedule of work shall be included in the work of this Section where they come within the general intent of the specifications as stated herein.

- C. The following items will not be painted, except as is the normal procedure of a manufacturer furnishing a finished product:
 - 1. Portions of metal other than Aluminum embedded in concrete. Aluminum to be embedded in concrete or in contact with concrete shall be coated to prevent electrolysis.
 - 2. Stainless steel, brass, bronze and aluminum other than exposed tubing.
 - 3. Packing glands and other adjustable parts and name plates of mechanical equipment.
 - 4. Manhole frames and covers.
 - 5. Non-ferrous metals, unless specifically noted otherwise.
 - 6. Electrical switch gear and motor control.

1.02 RELATED WORK NOT INCLUDED

- A. Valve identification is included in Section 15100.
- B. Shop priming and surface preparation of equipment and piping are specified in Section 09865. Additional instructions are included in the respective sections.

PART 2: PRODUCTS

2.01 MATERIALS

- A. All painting materials shall be equal to those manufactured by the Tnemec Company, Inc., or the Carbolite Company or equal. The painting schedule has been prepared on the basis of Tnemec products (unless otherwise noted) and Tnemec recommendations for application. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following schedule together with sufficient data substantiated by certified tests conducted at no expense to the Owner, to demonstrate its equality to the paint(s) named, is submitted to the Engineer in writing for approval within 30 days after the signing of the Contract Agreement. The type and number of tests performed shall be subject to the Engineer's approval.
- B. All painting materials shall be delivered to the mixing room in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Engineer's approval before using.
- C. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used.
- D. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.
- E. Work areas will be designated by the engineer for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes, and no plumbing fixture shall be used for this purpose.

3: EXECUTION

3.01 PREPARATION OF SURFACE

- A. All surfaces to be painted shall be prepared as specified herein and shall be dry and clean before painting. Special care shall be given to thoroughly clean interior concrete and concrete block surfaces to receive polyamide cured epoxy paint of all marks before application of finish.

- B. All metal welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, grease and dirt shall be removed by use of approved solvents, wire brushing or sanding.
- C. Concrete surfaces shall have been finished as specified in Division 3. Report unsatisfactory surfaces to the Engineer. Concrete shall be left for one month minimum Before painting and shall be free of dust, oil, curing compounds, and other foreign matter.
- D. Concrete masonry unit surfaces shall be smooth and cleaned of all dust, loose mortar and other foreign matter.
- E. Submerged concrete surfaces, and those subject to splashing, scheduled to be painted, shall be whip sandblasted with resultant finish e 1 to medium grain sandpaper.
- F. All surfaces that received a shop coat as specified in Section 09865 in which the shop coat has been removed before and during erection, shall be touched up at the damaged area. The touch-up coat shall be the same material as the shop coat and should be placed in such a manner to maintain uniform thicknesses and continuity of appearance.
- G. Exposed Pipe: Bituminous coated pipe shall not be used in exposed locations. Pipe which shall be exposed after project completion shall be primed in accordance with the requirements herein. Any bituminous coated pipe which is inadvertently installed in exposed locations shall be sandblasted clean before priming and painting. After installation all exterior, exposed flanged joints shall have the gap between adjoining flanges sealed with a single component Thiokol caulking to prevent rust stains.
- H. Primed or Coated Surfaces and Non-ferrous Surfaces: All coated surfaces shall be cleaned prior to application of successive coats. All non-ferrous metals not to be coated shall be cleaned. This cleaning shall be done in accordance with SSPC-SP-1, Solvent Cleaning.
- I. Galvanized and Zinc-Copper Alloy Surfaces: These surfaces to be painted shall be "Solvent Cleaned" and treated as hereinafter specified. Such surface not to be painted shall be "Solvent Cleaned."
- J. Aluminum embedded or in contact with concrete must be painted with one shop coat of zinc chromate followed by one heavy coat of aluminum pigmented asphalt paint.

3.02 WORKMANSHIP

A. General

1. At the request of the Engineer, samples of the finished work prepared in strict accordance with these specifications shall be furnished and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of the engineer where standard chart colors are not satisfactory.
2. Protection equipment, fittings and accessories shall be provided throughout the painting operation. Remove all electric plates, surface hardware, etc., before painting, protect and replace when completed. Mask all machinery name plates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the finished job is accepted.
3. On metal surfaces, apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an addition coat(s). On masonry, application rates will vary according to surface texture however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

B. Field Priming

1. Steel members, metal castings, mechanical and electrical equipment and other metals which are shop primed before delivery at the site, will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule.
2. Equipment which is customarily shipped with a baked-on enamel finish or with a standard factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and have been damaged, or where the shop coat or coats of paint have deteriorated, shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish, or a full-surface repainting shall be applied, to produce an attractive finish.

3. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of the Engineer with primers as recommended by the manufacturer of the finish paint.

C. Field Painting

1. All painting at the site shall be designated as Field painting and shall be under the direct and complete control of the Engineer, and only skilled painters and specialists, where required, shall be used on the work.
2. All paint shall be at room temperature before applying, and no painting shall be done when the temperature is below 60°F, in dust-laden air, when rain is falling, or until all traces of moisture have completely disappeared from the surface to be painted.
3. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.
4. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted and all exterior trim shall be back-primed before installation.
5. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. materials subject to weather shall be prime coated as quickly as possible. Surfaces of exposed members that will be in accessible after erection shall be cleaned and painted before erection.
6. All materials shall be brush painted unless spray painting is specifically approved by the Engineer.
7. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept fresh, warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be scraped off, or otherwise removed, and repainted in accordance with the Engineer's directions.
8. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.

3.03 CLEANUP

- A. At all times keep the premises free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting, remove all tools, surplus materials, and all rubbish from and about the work area and leave the work "broom clean" unless more exactly specified.
- B. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, equipment, etc., leaving the work ready for inspection.

END OF SECTION

SECTION 11317

LIFT STATION SUBMERSIBLE PUMPS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install three (3) submersible pumps, upper and lower guide rail bracket assemblies, and three (3) pipe guide rails with guide bar supports for each pump. Furnish and install three (3) fall protection safety nets shall be Halliday, Bilco or equal. Include training, start-up and all the necessary appurtenances and as shown on the drawings for the South Conway submersible pump type lift station within the City of Mission.
- B. Each pump shall be fitted with a stainless steel wire rope assembly, with a minimum length of 40 feet for lifting the pump. The working load rating of the lifting system shall be a minimum of 50% greater than the pump weight. Each pump motor shall be equipped with a minimum length of 50 feet of power and control cable(s) in accordance with NEC standards.
- C. It is the CONTRACTOR'S responsibility to coordinate the pump system requirements. The CONTRACTOR shall verify the pump motors' protection requirements with the pump manufacturer and supplier. This information shall be given to the pump control panel manufacturer to provide the required interface circuitry. The pump motor protective systems include the use of special function modules, these shall be provided to the control panel manufacture to mount, wire and test within the control panel.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Safety Protection it is the installing CONTRACTOR'S responsibility to have all OSHA required safety equipment for confined space entry. It is also the installing CONTRACTOR'S responsibility to comply with all OSHA rules and procedures for confined space entry, and any other OSHA rules which are applicable for this work.
- B. Electrical work is included in Division 16

1.03 QUALIFIED MANUFACTURER

- A. ABS

- B. The manufacture and suppliers shall be aware that being listed above does not mean acceptance. The specifications shall be reviewed and any deviations shall be submitted to the engineer not less than 10 days before the bid opening.

1.04 PRE-SUBMITTAL INFORMATION

- A. Due to the importance of the pumping system operating in the range and under the conditions specified, the pump supplier shall provide complete information to the engineer prior to bidding. The Engineer will issue an addendum describing acceptable equipment prior to the bid date. The bidder shall include all expenses necessitated by use of non-specified equipment in his bid price.
- B. Presubmittal data shall include, but not be limited to, the following requirements to be submitted to the Engineer not less than 10 days prior to bid date:
 - a. Full description and performance data on all substitute items proposed with references for verification of performance for such equipment already in service, all data in triplicate.
 - b. Detailed description of how the proposed substitute differs from that specified including but not limited to materials of construction, fabrication, operation, warranty, service, corrosion protection, power consumption, maintenance requirements, etc.
 - c. Detailed discussion of why the proposed substitute is equal or superior to that specified in material of construction, fabrication, operation, warranty, service, corrosion protection, power consumption, maintenance requirements, etc.
 - d. Tracings and four copies of revised prints reflecting in detail any and all changes in arrangements for materials, equipment, piping, fabrication, erection, maintenance, power supply, etc.
 - e. Name and telephone number of person(s) to contact to answer questions or supply additional information.

1.05 SUBMITTALS

- A. Copies of all materials required to establish compliance with these specifications shall be submitted in accordance with the provisions of Section 01340. Submittals shall include at least the following:
 - 1. Certified shop and erection drawings showing all important details of construction, dimensions, and anchor bolt locations.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.

3. All information required in Section 01340.
4. A complete total bill of materials for all equipment.
5. Pump curve showing head versus capacity throughout the range of the pump.

1.06 SERVICE CONDITIONS

- A. The pumping units specified in this section will be used to lift and transfer domestic wastewater using the design flow criteria indicated in the Table below.

	SIZE (inch)	FLOW (gpm)	TDH (ft)	HP (min)	RPM (min)
Design Point	6	600	48	15	1710
Secondary Point	6	680	43	15	1710

Minimum Solid Size - 4.4"

Each pump shall be given a certified non-witness performance test to prove compliance to the performance data above. Test curves shall be submitted to the engineer for approval prior to shipment.

1.07 FIELD SUPERVISION

- A. The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustment necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment.

1.08 GUARANTEE

- A. All equipment shall be guaranteed against defects in material and workmanship for a period of one year from date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner. The warranty of the submersible pump shall be as indicated in Paragraph 2.04 of this Specification Section.

PART 2: PRODUCTS

2.01 PUMP DESIGN

- A. Submersible Pump: The pump and integrated, close-coupled motor shall be a water tight, fully submersible unit, capable of handling raw unscreened sewage,

activated sludge, storm water, and other similar solids-laden fluids without clogging. The pump with the appurtenances and cable shall be capable of continuous submergence in the pumped liquid to a depth of 65 feet.

This is a wet-pit installation.

- B. Quick Connect Guide Rail System: In order to prevent binding or separation of the pump from the guide rail system, the pumps shall connect to the guide rail base automatically and firmly, guided by two guide bars extending from the top of the station to the discharge base elbow.
- C. Once complete there shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump shall bear directly on the floor of the sump. Power and pilot cable supports shall be provided and consist of a wire braid sleeve with attachment loops or tails to connection the under side of the access frame.

2.02 PUMP CONSTRUCTION

- A. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 316 stainless steel or brass construction. All metal surfaces coming into contact with the pumped media, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a high solids two part epoxy paint finish on the exterior of the pump.
- B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit.
- C. Rectangular cross-sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
- D. Impeller: The impeller shall be of gray cast iron, Class 35B, dynamically balanced, multiple vaned, semi open, backswept non-clogging design. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Mass moment of inertial calculations shall be provided by the pump manufacturer upon request. Impellers shall be capable of

passing a minimum 3-inch diameter solid. All impeller shall be coated with an acrylic dispersion zinc phosphate primer.

- E. Insert Ring: A hardened, replaceable insert ring having an integral machined spiral shaped groove shall be installed in the pump volute. The clearance between the insert ring and the impeller shall be adjustable.
- F. Pump Volute: The pump volute shall be single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with centerline discharge. Passages shall be smooth, and large enough to pass any solids that may exit the impeller. The motor shall be attached to the volute by stainless steel bolts. The motor unit, with impeller attached, shall be removable from the volute without requiring removal of the impeller, and without disturbing the watertight integrity of the motor unit.
- G. Rotating Assembly: The rotating assembly (impeller, shaft and rotor) shall be dynamically balanced such that undue vibration or other unsatisfactory characteristics will not result when the pump is in operation.
- H. Shaft: Pump and motor shaft shall be solid continuous shaft. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be ASTM A572 Grade 50 carbon steel and shall be completely isolated from the pumped liquid.
- I. Mechanical Seals: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The lower seal shall be independent of the impeller hub. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten-carbide seal ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary tungsten-carbide seal ring and one positively driven rotating tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. For special applications, other seal face materials shall be available.

Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come into contact with the lower bearings.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating

members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate continuously while non-submerged without damage while pumping under load.

Seal lubricant shall be FDA-approved, non-toxic.

- J. Bearings: The pump shaft shall rotate on three grease-lubricated bearings. The upper bearing, provided for radial forces, shall be a single roller bearing. The lower bearings shall consist of one roller bearing for radial forces and one or two angular contact ball bearings for axial thrust.

The minimum B₁₀ bearing life shall be 100,000 hours at any point along the usable portion of the pump curve at maximum product speed.

The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down.

2.03 MOTOR

- A. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 180° C (355° F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be set to open at 125°C and shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall contain two distinct and separate terminal boards. The first terminal board shall be used for the connection of the pilot sensor leads with the pilot sensor cable. The second

terminal boards shall be utilized for the line power connection to the motor stator leads. This power terminal board shall use threaded compression type binding posts to connect the cable conductors and motor stator leads. The power terminal board shall separate and seal the junction chamber from the stator housing. The use of wire nuts or crimping type connectors is not acceptable. The motor and pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. The chart shall also include data on starting and no-load characteristics. The motor shall be suitable for operation on all modern PWM type variable frequency drives.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater with loss of watertight integrity to a depth of at least 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

- B. Protection: All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. Should high temperature occur, the thermal switches shall open, stop the motor and activate an alarm.
- C. Cable Entry/Junction Chamber: The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a feed through type terminal board of non-hydroscopic material, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.
- D. Cooling System: Each pump/motor unit shall be provided with an integral, self-supplying cooling system. The motor water jacket shall encircle the stator housing and shall be of cast iron, ASTM A-48, Class 35B. The water jacket shall thus provide heat dissipation for the motor regardless of whether the motor

unit is submerged in the pumped media or surrounded by air. After passing through a classifying labyrinth, the impeller back vanes provide the necessary circulation of the cooling liquid, a portion of the pumpage, through the cooling system. Two cooling liquid supply pipes, one discharging low and one discharging high within the jacket, shall supply the cooling liquid to the jacket. An air evacuation tube shall be provided to facilitate air removal from within the jacket. Any piping internal to the cooling system shall be shielded from the cooling media flow allowing for unobstructed circular flow within the jacket about the stator housing. Two cooling liquid return ports shall be provided. The internals to the cooling system shall be non-clogging by virtue of the dimensions. Drilled and threaded provisions for external cooling and seal flushing or air relief are to be provided. The cooling jacket shall be equipped with two flanged, gasketed and bolted inspection ports of not less than 4"Ø located 180° apart. The cooling system shall provide for continuous submerged or completely non-submerged pump operation in liquid or in air having a temperature of up to 40° C (104° F) in accordance with NEMA standards. Restrictions limiting the ambient or liquid temperatures at levels less than 40°C are not acceptable.

2.04 WARRANTY

- A. All submersible pumps shall be covered by a 5 year pro-rated warranty which shall be part of the submittal documentation. The pump manufacturer will pay cost of parts and labor during the warranty period, provided that the pump, with cable attached, is returned prepaid to an authorized repair facility for repairs. Coverage of parts and labor will be provided for periods indicated below. This warranty shall not apply to any product or part of product which has been subjected to misuse, misapplication, accident, alteration, neglect, or physical damage and monitoring equipment has been bypassed or removed. Warranty does not cover costs for standard and/or scheduled maintenance or parts that, by virtue of their operation require replacement through normal wear, unless a defect in material or workmanship can be determined by manufacturer. Warranty period shall be as follows and from the date of shipment from the factory or other manufacturer approved point in time.
1. 0-18 months warranty is 100%
 2. 19-39 months warranty is 50%
 3. 40-60 months warranty is 25%

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install the submersible pumps and control system as shown on the drawings and as recommended by the manufacturer.

3.02 INSPECTION AND TESTING

- A. After all pumps have been completely installed, the contractor shall conduct in the presence of the engineer, such tests as are necessary to insure that the pumps are perform satisfactorily. Field tests shall include all pumps included under this section. The contractor shall supply the water necessary to complete the field tests.
- B. If the pump performance does not meet the Specifications, corrective measures shall be taken by the contractor, or pumps shall be removed and replaced with pumps that satisfy the conditions specified.

END OF SECTION

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SECTION 15061

FIBERGLASS MANHOLES AND WETWELLS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all materials, labor and equipment and construct fiberglass manholes and wetwells as shown on the Drawings and as specified herein.

1.02 RELATED WORK NOT INCLUDED

- A. Excavation and backfill is specified in Section 02221.
- B. Gravel bedding is included in Section 02221.
- C. Cast-in-place concrete is included in Division 3.
- D. Manhole frames and covers are included in Section 05500.

1.03 GOVERNING STANDARDS

- A. ASTM D-3753: Standard Specification for Glass-Fiber Reinforced Polyester Manholes.
- B. ASTM C-581: Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service.
- C. ASTM D-2412: Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading.
- D. ASTM D-695: Test Methods for Compressive Properties of Rigid Plastics.
- E. ASTM D-2584: Test Method for Ignition Loss of Cured Reinforced Resins.
- F. ASTM D-790: Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and electrical Insulating Materials.
- G. ASTM D-2583: Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor.

H. AASHTO H-20: Axial Loading.

1.04 QUALITY ASSURANCE

A. Experience Requirements: Manholes and wetwells shall be the product of one (1) manufacturer having at least 5 years successful experience manufacturing fiberglass manholes and wetwells of the types and sizes as specified herein.

B. Inspection:

1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the owner. Such inspections shall be made at the place of manufacture, or at site of delivery, and the sections shall be subject to rejection on account of failure to meet any of the specification requirements as specified herein. Sections rejected after delivery to the job site shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed shall be acceptable if repaired or removed and replaced at the contractor's expense.
2. At the time of inspection, the material will be examined for compliance with the requirements of this specification and the approved drawings. All sections shall be inspected for general appearance, dimension, scratch-strength, blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
3. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval.

C. Markings: All manholes and wetwells shall be marked on the inside. These markings shall be permanent and include:

1. Manufacturer Identification (Name)
2. Manufacturing Serial Number
3. ASTM Designation
4. Diameter and Length

D. Certification: The manufacturer of the fiberglass wetwells and manholes shall certify that all physical and chemical requirements listed in this specification are met. The certification shall be submitted to the engineer in writing and shall

consist of a copy of the manufacturer's test report, accompanied by a copy of the test results, that the manhole has been sampled, tested, and inspected in accordance with the provisions of ASTM 3753 and this specification, and meets all requirements. An authorized agent of the manufacturer shall sign each certification.

E. Acceptable Manufacturers:

1. Containment Solutions, Inc., Conroe, TX.
2. L.F. Manufacturing, Inc., Giddings, TX.
3. Or equivalent.

1.05 SUBMITTALS

- A. In accordance with Section 01340 .Submittals..
- B. Manufacturer.s descriptive literature and recommended methods of installation.
- C. Certificates: Manufacturer.s certification in accordance with 1.04.D.
- D. Warranties

1.06 GUARANTEE/WARRANTY

- A. In addition to the one (1) year warranty provided by the Contractor, wetwells and manholes shall be warranted by the manufacturer for a period of twenty (20) years against internal or internal corrosion and against structural failure.
- B. Contractor shall obtain any training from the manufacturer as required for conditions of the warranty to be met.
- C. If any wetwell or manhole fails within the warranty period, the manufacturer shall either repair it, deliver a replacement unit to the point of original delivery, or refund the original purchase price.

1.07 DELIVERY, STORAGE AND HANDLING

- A. FRP wetwells and manholes shall be lifted by the installation of lifting lugs as specified by the manufacturer on the outside surface near the top of the wetwell. Wetwells and manholes may also be lifted in the horizontal position with two slings on a spreader bar. Use of chains or cables in contact with the wetwell/manhole surface is prohibited.

- B. FRP wetwells and manholes may be stored upright or horizontally, however, the wetwell vertical deflection shall not exceed 4% of the diameter. The wetwell shall not be dropped or impacted.
- C. Additional handling and installation instructions shall be in accordance with the FRP manufacturer's instructions.
- D. Each FRP section manufactured in accordance with the drawings shall be clearly marked to indicate the intended installation location. The contractor shall be responsible for the installation of the correct FRP sections in their designated locations.

PART 2: PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Fiberglass reinforced polyester wetwells and manholes shall be manufactured from commercial grade polyester resin having fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection systems. Wetwells and manholes shall be a one-piece unit.

2.02 MATERIALS

- A. Resins: The resins used shall be a commercial grade unsaturated polyester resin.
- B. Reinforcing Materials: The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
- C. Surfacing Materials: If reinforcing materials is used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.
- D. Fillers and Additives: Fillers, when used, shall be inert to the environment and wetwell construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

2.03 FABRICATION

- A. Exterior Surface: The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.
- B. Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of grazing, delamination, and blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted up to 6 square feet if they are less than 3/4 inch in diameter and less than 1/16 inch deep.
- C. Cylinder Section: Cylinders shall meet all requirements for pipe stiffness as required in ASTM D3753. All wetwells and manholes 6-foot diameter and larger shall be rib reinforced.
- D. Fiberglass Reinforced Top/Cone: The fiberglass wetwell top or manhole cone shall be fabricated using fiberglass material as specified in Paragraph 2.02 and shall meet all requirements in 2.04 of this Section. Tops and cones to be attached to the cylinder at the factory with fiberglass layup in compliance with ASTM-D3299.
 - 1. Wetwell Tops and Hatch Openings:
 - a. Wetwells shall be provided with glass reinforced tops as shown on the Drawings and shall be joined to the cylinder section at the factory with resin and glass fiber reinforcement forming a monolithic structure to prevent infiltration and exfiltration.
 - b. Wetwell top shall be designed to withstand backfill and concrete slab. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to top per ASTM-D3299. Stiffeners shall be of non-corrosive materials encapsulated in fiberglass. FRP encapsulated wood or lumber is not permitted.
 - c. Hatch opening dimensions and position to be as shown on the drawings and as specified for specific equipment.
 - d. Vapor barrier lip around hatch opening shall be constructed of fiberglass pultruded structural shapes. Vapor barrier lip shall extend to the hatch frame as shown on the Drawings so that no concrete of the top slab is exposed to the wetwell interior. Contractor to coordinate this dimensional requirement.
 - 2. Manhole Cones:
 - a. The manway cone on manholes must provide a bearing surface on which a standard frame and cover may be supported and adjusted to grade.
 - b. The cone shall be concentric and shall be joined to the cylinder section at the factory with resin and glass fiber reinforcement forming a monolithic structure to prevent infiltration and exfiltration.

- c. Manway cone shall have a raised collar around the manway opening over which HDPE manhole adjustment rings may be installed.
- E. Bottom Flange: All wetwells shall have an integral bottom flange of minimum 3-inch width as shown on the drawings for embedment and anchoring of the cylinder in the concrete base slab. Where indicated on the drawings, manholes shall also have bottom flange.
- F. Stubouts and Connections:
 - 1. Pipe connections 4. through 15. in diameter shall be made by means of .Inserta Tee. Watertight compression connection. Connections may be factory installed.
 - 2. Pipe connections larger than 15. in diameter shall be factory installed and be of the following types:
 - a. Rubber gasketed PVC sewer pipe stubouts installed with resin and glass fiber reinforced layup. Gaskets shall meet the same performance requirements of the sewer pipe to be installed.
 - b. PVC or FRP pipe stubouts with resilient pipe-to-wetwell connectors (boots) conforming to the requirements of ASTM C-923.
- G. Defects not Permitted:
 - 1. Exposed fibers: glass fibers not wet out with resin.
 - 2. Resin runs: runs of resin and sand on the surface.
 - 3. Dry areas: areas with glass not wet out with resin.
 - 4. Delamination: separation in the laminate.
 - 5. Blisters: light colored areas larger than 1/2 inch in diameter.
 - 6. Crazing: cracks caused by sharp objects.
 - 7. Pits or Voids: air pockets.
 - 8. Wrinkles: smooth irregularities in the surface.
 - 9. Sharp projection: fiber or resin projections necessitating gloves for handling

2.04 DESIGN REQUIREMENTS

- A. Wetwells and manholes shall be designed by the manufacturer to perform as underground structures at the depths required.

- B. Complete manhole FRP structures shall be capable of supporting the top slab covers, frames, and soil overburdens plus a live load equivalent to AASHTO HS-20 loading. To establish this rating, the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.
- C. Cylinders shall be resistant to buckling when empty and when the groundwater elevation is at grade.
- D. The anchoring wall structure at the embankment within the reinforced concrete base zone shall be designed to resist external hydrostatic water forces of an empty or full cylinder with the groundwater at grade elevation.
- E. All cutouts for pipe connections specified and shown on the Drawings shall be capable of maintaining the unit's structural integrity.
- F. Stiffness: The cylinder shall be tested in accordance with ASTM Method D 2412. The wetwell cylinder shall have the minimum pipe-stiffness values shown in the following table when tested in accordance with ASTM 3753, Section 8.5, (note 1).

Stiffness Requirements

Length, Ft.	F/AY, psi
3 to 6	0.72
7 to 12	1.26
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

G. Physical Properties:

	<u>Hoop Direction</u>	<u>Axial Direction</u>
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modulus (psi)	0.8×10^6	0.7×10^6
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modulus (psi)		
(no ribs - 48", 60", 72")	1.4×10^6	0.7×10^6
(with ribs - 96", 144")	0.7×10^6	0.7×10^6

H. Dimensional Requirements:

1. The wetwells and manholes shall be a circular cylinder, sized per the plans for the applicable locations. Wetwells shall be produced per the length indicated on the plans $\pm 1/2$.. Manholes shall be produced in half-foot increments of length ± 2 inches. Tolerance on the inside diameter shall be $\pm 1\%$. Other diameters as agreed upon between purchaser and the manufacturer are covered by this specification.
2. The minimum wall thickness for all wetwells and manholes at any depth shall be 0.50 inches measured to the nearest percent (0.01 inches) with micrometer, caliper, gauge or other suitable instrument. A minimum of one thickness reading per 33.4 ft² of laminated surface in area of constant thickness shall be made. Through regions of wall taper, sufficient checks must be made to establish actual thickness. The test shall be run at least once per ten manholes.

PART 3: EXECUTION

3.01 EXCAVATION

- A. The Contractor shall do all necessary excavation for the various manholes. Such excavations shall be of sufficient size as to permit the proper installation of the base and wall forms, and allow room for the striping of such forms. All such excavating shall conform to the size and dimensions as shown on the drawings, plus a maximum of four feet to permit working room.
- B. Care shall be taken to insure that the excavation is not carried to a greater depth than required. If it becomes necessary to shore the walls of the excavated area, such shoring shall be of two inch material. Shoring shall be braced in such manner as to insure support of the walls and also permit the construction of the manhole itself without necessitating the removal of any shoring until such time as the entire manhole is completed. No shoring shall be left or back filled around, unless authorized by the ENGINEER. Shoring shall remain in place for at least twenty-four after the masonry or concrete work has been completed.
- C. Contractor shall be responsible for handling groundwater to provide firm, dry subgrade for the structure, shall prevent water from rising on new poured-in-place concrete within 24 hours after placing, and shall guard against flotation or other damages resulting from groundwater or flooding. The Contractor shall be fully responsible and liable for all damages resulting from failure of the dewatering plan or system.

3.02 GENERAL CONSTRUCTION METHODS

- A. All wetwell and manhole work shall be completed and finished in a careful and workmanlike manner, special care being given to sealing the joints around all pipe that extend through the walls of the manhole or wetwell.
- B. Field-installed connections for sewer pipe 4" through 15" in diameter shall be made by means of watertight compression connection (e.g. "Inserta Tee", or approved equal) as shown on the plans and details. Cutouts and installation shall be in strict accordance with manufacturer's written instructions utilizing installation equipment (e.g. hole saw) approved for use by the manufacturer of the fitting. Use of equipment which does not meet this requirement is expressly prohibited. Jig saws, saber saws, or axes, hammers, chisels, and similar impact type tools shall not be used.
- C. Field fabrication of stubouts using FRP lay-up reinforcement is prohibited unless approved in writing by the Engineer.
- D. All connections shall be made on flat surfaces of cylinder or top away from structural ribs. Contractor shall coordinate location and elevations of all connections with the manufacturer before fabrication to ensure this requirement is met.
- E. All cut edges where glass fiber is exposed (e.g. hole saw cuts in the cylinder section or top) shall be coated with resin to prevent wicking of moisture into fiberglass laminate. Contractor shall use resin of the same type and grade as used in the fabrication of the wetwell/manhole.
- F. The bottom of manholes shall be completed by installing sufficient additional concrete/grout to shape or form the bench as shown on the drawings.
- G. The cast-in-place concrete base slab shall be placed on a 6-inch minimum bed of gravel. Sub-base soil below gravel bed shall be thoroughly compacted to minimum 95% Standard Proctor Density.
- H. The bottom of the fiberglass manhole or wetwell shall be cast-in-place a minimum of 4 inches and shall be adjusted in grade so that the top slab section is at the elevation specified in the drawings. Contractor shall be responsible for coordinating and verifying all dimensional requirements as specified and shown on the Drawings.
- I. Contractor shall internally brace fiberglass wetwell tops during placement of top slab concrete to support and prevent deflection of the top while the slab cures.

3.03 BACKFILLING

- A. Anti-flotation rings made from lean concrete mix shall be poured in place around manhole and wetwell in quantities as shown on the Drawings. Anti-flotation rings

shall be poured only after the concrete base slab has been allowed to cure the required time and the forms and shoring have been removed.

- B. The backfilling around the outside of manholes shall commence as soon as the anti-flotation ring has cured. Backfill shall be placed in layers of not more than 12 inches and shall be thoroughly tamped before the next layer is installed.
- C. Backfill shall be either hand or mechanically tamped. Whichever method is used, care must be exercised to insure that the backfill is thoroughly compacted to 90% Standard Proctor Density (ASTM D-690).
- D. Unless shown otherwise on the drawings, suitable material selected from the excavation shall be used for backfill. Material shall be subject to approval by the Engineer.

3.04 DROP MANHOLES

- A. Drop manholes shall consist of construction of a standard sanitary sewer manhole with one standard drop connection on one side only, as shown in the detail drawings. All materials used in the drop connection shall conform to the requirements of the pertinent specification.

3.05 CASTINGS AND CLEANING

- A. Manhole frames and covers within the limits of bituminous concrete pavement shall be set at the elevation of the top of the wearing course.
- B. All new manholes and wetwells shall be thoroughly cleaned by the removal of all accumulations of silt, debris and foreign matter of any kind, prior to final inspection.

3.06 MANHOLE TESTING

- A. Refer to Section 02570 for manhole testing requirements.

3.07 WETWELL TESTING

- A. Successful passage of a hydrostatic test shall be required for acceptance of all wetwells. Testing shall be conducted with all connections in place. If a wetwell fails a hydrostatic leakage test, it shall be made watertight and retested.
- B. Test Procedure:
 - 1. Pneumatic test plugs with a sealing length equal to or greater than the diameter of the connecting pipe to be sealed shall be used to plug all influent, effluent, and vent pipes.

2. Wetwell shall be filled with water (provided by the Contractor and as approved by the Engineer) to a pre-determined level at or immediately below the underside of the fiberglass top. Additional water may be added over a twenty-four (24) hour period to compensate for absorption and evaporation losses.
3. At the conclusion of the twenty-four (24) hour saturation period, the wetwell shall be filled to the original level and the water level observed by reference to gradations marked on a measuring rod or a pump guide rail.
4. The wetwell shall be considered to pass the hydrostatic test if the rate of leakage or water loss is equal to or less than 0.025 gallons per foot diameter per foot of wetwell depth per hour.

C. Testing and Certification:

1. Testing shall be done by the Contractor and witnessed by the Engineer or his representative. All wetwells shall be tested as finished and completed for final acceptance.
2. Any defective work or materials shall be corrected or replaced by the contractor and retested. This shall be repeated until all work and materials are acceptable.

3.08 PAYMENT

- A. Manholes shall be paid for at the Contract unit price bid per each manhole for the various sizes, types and various depths of manholes complete in place and will be full compensation for all materials required, operations, labor, tools, equipment, and all other incidentals necessary to complete the work shown on the drawings and specified herein.
- B. Wetwells as well as all appurtenances to the wetwell shall be paid for as part of the lump sum price for their respective lift station. No additional payment will be made for testing requirements or other incidental requirements related to the wetwell for a complete lift station installation.

END OF SECTION

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SECTION 15062

DUCTILE IRON PIPE AND FITTINGS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install, in the locations inside, through and adjacent to the lift station structures and other areas as shown on the Drawings. All ductile iron piping, fittings, and appurtenances shall be as specified herein.
- B. All above ground pipe shall be flanged ductile iron pipe painted in accordance with the requirements in Division 9 unless otherwise noted. There are special coating requirements for the ductile iron pipe within the lift station wetwells. These coating requirements are included in this Section.

1.02 RELATED WORK

- A. Trenching, bedding and backfill for pipe is included in Section 02221.
- B. Concrete work is included in Division 3.
- C. Lining and Coating shall be as specified herein and as provided for in Section 09900.
- D. Valves and appurtenances are included in Section 15100.

1.03 DESCRIPTION OF SYSTEMS

- A. Piping shall be installed in those locations shown on the Drawings.
- B. The piping within the lift station wetwells herein is intended to be special types of ductile iron pipe and fittings for use in a corrosive wastewater environment. The system shall be Protecto 401 lining with a Ceramawrap Epoxy exterior coating or approved equal.
- C. All bolts on flanged joints of the ductile iron pipe shall be 316 stainless steel.

1.04 QUALIFICATIONS

- A. All of the ductile-iron pipe and cast-iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be

designed, constructed, installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

1.05 SUBMITTALS

- A. Submit to the Engineer within thirty (30) days after execution of the Contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. All ductile-iron pipe and cast-iron fittings to be installed under this Contract shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. Furnish in duplicate to the Engineer sworn certificates of such tests and their results. In addition all ductile-iron pipe and cast-iron fittings to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory selected by the Owner. The manufacturer's cooperation shall be required in these inspections. The cost of foundry inspection requested by the Owner of all pipe approved for this Contract, will be borne by the Owner.
- C. Shop Drawings including layouts within, through, and adjacent to the lift stations shall be submitted to the Engineer for approval in accordance with General Conditions and Section 01340 and shall include dimensioning, methods and locations of supports and all other pertinent technical specifications for all piping to be furnished. Shop drawings shall be prepared by the pipe manufacturer.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Ductile iron pipe for the wetwell shall meet the following requirements:
 - 1. Ductile iron pipe shall conform to ANSI A21.51 and AWWA C 151. A minimum of Class 51 pipe shall be supplied for all sizes of pipe unless specifically called out in the Drawings. Thickness of pipe to be supplied shall be as required under AWWA C151 (ANSI 21.51). Type 1 Bedding Conditions shall be used.
 - 2. The pipe shall be supplied in lengths not in excess of 20 feet. Pipe fittings for yard piping shall be standard mechanical joint pipe or restrained joint where pipe is buried. Flange joint pipe shall be used on piping inside the wetwell, adjacent to the headbox or where shown on the Drawings. Pipe shall be as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company or Clow Corporation.

- B. All ductile iron pipe fittings for yard piping shall be cast iron or ductile iron with a minimum pressure rating of 150 psi. Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to ANSI A21.11 for mechanical and push-on type joints. Flanged fittings shall be furnished faced and drilled to 125 pounds template and conform to ANSI B16.1 with full face gaskets.
- C. Ductile-iron pipe in the wetwell and adjacent to the headbox shall meet the following requirements.
1. Flanged ductile-iron pipe shall conform to current ANSI Specification A21.15 with factory applied screwed long hub flanges except as otherwise specified hereinafter. Flanges shall be faced and drilled after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and shall be flush with end of pipe conforming to ANSI B16.1, 125 pound std.
 2. Fittings shall be cast-iron as specified herein. Flanges and flanged fittings shall be flat face and shall conform to ANSI A21.10 for 250 psi pressure rating. Full face type 1/16-inch thick rubber ring gaskets shall conform to AWWA C111 and equal to "Rainbow."
 3. Wall castings shall be of the size and types shown on the Drawings
 4. Pipe thickness classes shall be a minimum of Class 51 for all sizes of pipes.
 5. Prior to commencing work, all systems for pipe shall be submitted to the Engineer for approval.
 6. Pipe and fittings shall be standard thickness cement mortar lined and bituminous seal coated on the inside in accordance with ANSI Specification 21.4. A plus tolerance of 1/8-in will be permitted. Ring gaskets shall be of approval composition suitable for the required service.
 7. Pipe and fittings exposed to view on the outside of the wetwell and headbox shall not receive the special Ceramawrap coating but shall be shop primed on the outside with one coat of Koppers No. 621 Rust Inhibitive Primer and provided with a finished coat as specified under Section 09900.
 8. Bolts, washers and nuts on flanged fittings shall be Grade B, ASTM A-307, 316 stainless steel and conform to ANSI B16.1 for Class 125.

2.02 Ductile Iron Pipe Lining

- A. The entire surface to be coated shall be abrasive blasted. The intent of this specification is that 100% of the surface be struck by the blast media so that all loose oxides and rust are removed.
- B. After surface preparation and within 8 hours of surface preparation the entire surface with the exception of the spigot end, shall receive an average of 25 mils, 22 mils minimum, of Ceramawrap Epoxy. If any rusting is apparent prior to coating the surface, the entire area must be reblasted as specified.
- C. Due to the tolerances involved, the spigot end from the gasket area to the end of the spigot must be coated with 6 mils average, 10 mils maximum of Ceramawrap Epoxy. Care should be taken that the Ceramawrap Epoxy is smooth without excess buildup on the spigot end.
- D. Testing of Coating
 - 1. The film thickness of the coating shall be checked using a magnetic film thickness gauge. Measurements shall be taken per SSPC PA2 Section 5.1.
 - 2. The coated areas of the pipe from the socket edge area of the spigot back to the bell face shall be tested for pinholes using a 2000 volt pinhole detection test. Any pinholes found shall be repaired prior to shipment.
- E. Any areas where damage has occurred due to handling shall be repaired using Ceramawrap Epoxy prior to installation.

PART 3: EXECUTION

3.01 HANDLING PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.
- B. All pipe and fittings shall be subjected to a careful inspection before being installed.
- C. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

3.02 LAYING UNDERGROUND DUCTILE IRON FITTINGS

- A. Concrete thrust blocks shall be installed at all fittings and other locations as directed by the Engineer. Minimum bearing area shall be as shown on the Drawings. Joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms or sand bags shall be provided for thrust blocks.
- B. Push-on joints shall be made in accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be laid shall then be aligned and inserted in the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.
- C. Mechanical joints shall be made in accordance with Appendix A of ANSI/AWWA C111 and the manufacturer's instructions. Thoroughly clean and lubricate the joint surfaces and rubber gasket with soapy water before assembly. Bolts shall be tightened to the specified torques. Under no conditions shall extension wrenches or pipe over handle of ordinary ratchet wrench be used to secure greater leverage.

3.03 INSTALLING DUCTILE IRON PIPE

- A. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before erection.
- B. Sleeves shall be installed of proper size for all pipes passing through floors or walls as shown on the Drawings. Where indicated on the Drawings or required for liquid or gas-tightness the pipe be sealed with a mechanical seal equal to Link-Seal as manufactured by Thunderline Corp., Wayne, Michigan (non-water bearing structures only).
- C. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall in accordance with the requirements of the piping layout and jointing method and their locations shall be verified from approved piping layout drawings and the structural drawings. Pipe hangers and supports are specified in Section 15094.
- D. Layouts for hanger and supports shall be submitted to the Engineer for approval.

- E. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same American Standard as the flanges. Bolts and nuts shall, except as otherwise specified or noted on the drawings, be Grade 5 conforming to the ASTM Standard Specification for Low-Carbon Steel, Externally and Internally Threaded Standard Fasteners, Designation A307-68. Bolt studs and studs shall be of the same quality as machine bolts. Gaskets shall be full face gaskets of rubber with cloth insertion. Gaskets 12-inches in diameter and smaller shall be 1/16-inch thick larger than 12 inches in diameter and 3/32-inch thick.
- F. All valves, fittings, equipment, and appurtenances needed upon the pipelines shall be furnished, installed, and jointed as indicated on the Drawings or as required. Valves and appurtenances are included in Section 15100. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

3.04 TESTING

- A. Testing of ductile iron pipelines shall be in accordance with the testing requirements for the system that it is a part.

3.05 SURFACE PREPARATION AND PAINTING

- A. All piping and fittings exposed to view shall have its surface prepared and be painted as specified in Section 09900. Surface preparation and shop priming is a part of the work of this Section. Pipe marking is included in Section 09900, but it shall be part of the work of this Section to assist as required by the Engineering in identifying pipe contents, direction of flow and all else required for proper marking of pipe.

END OF SECTION

SECTION 15063

POLYVINYL CHLORIDE (PVC) SEWER PIPE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install and test polyvinyl chloride (PVC) sewer pipe and fittings, complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK NOT INCLUDED

- A. Trenching, backfilling and compacting is included in Section 02221.
- B. Fiberglass Manholes is included in Section 15061.

1.03 SUBMITTALS

- A. Submit to the Engineer, within thirty days of the Effective Date of the Agreement, the name of the pipe and fittings suppliers and a list of materials to be furnished.
- B. Submit to the Engineer, as provided in Section 01340, shop drawings and schedules of all PVC pipe and fittings required.
- C. Prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM standards specified herein.

1.04 QUALITY ASSURANCE

- A. All PVC pipe and fittings shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 as applicable. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection such as charges by Owners' representatives, travel cost, etc., will be borne by the Owner.
- B. Inspections of the pipe may also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification

requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

PART 2: PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

- A. Pipe and fittings shall be manufactured from resins made in accordance with ASTM D1784. The pipe shall be PVC SDR 35 solid wall pipe for depths up to ten (10) feet of cut and SDR 26 solid wall pipe for depths over ten (10) feet. The pipes shall be full diameter dimensions and shall conform to ASTM D3034. Straight pipe shall be furnished in lengths of 13-feet and or 20-feet. Wyes shall be furnished in lengths of not more than 3-feet. Saddle wyes will not be allowed.
- B. PVC pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Elastomeric gaskets shall conform to ASTM F477.
- C. All fittings and accessories shall have bell and/or spigot configurations compatible with the pipe.

PART 3: EXECUTION

3.01 HANDLING AND CUTTING PIPE

- A. Pipe and fittings are slightly brittle. Care shall be taken in shipping, handling and laying to avoid damaging the pipe and fittings. Extra care will be necessary during cold weather construction.
- B. Any pipe or fitting showing a crack or which has received a blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. All pipe ends shall be square after cutting.
- D. While stored, pipe shall be adequately supported from below at not more than three foot intervals to prevent deformation. Pipe shall not be stacked higher than six feet. Pipe and fittings shall be stored in a manner which will keep them at ambient outdoor temperatures. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings which allows temperature buildup when exposed to direct sunlight will not be permitted.

3.02 JOINTING POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

- A. PVC sewer pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM Standards and detailed instructions of the manufacturer.
- B. All manhole connections shall be as shown on the Drawings, and shall explicitly follow the recommendations of the manufacturer of the fiberglass manholes.

3.03 INSTALLING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. All pipe shall be installed in accordance with Texas Commission on Environmental Quality (TCEQ) rules regarding separation distances for water and sewer lines. Specifically, the Contractor shall adhere to those requirements set forth in 30 TAC Chapter 217, Subchapter C, Paragraph 217.53(d).
- B. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-in. per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.
- C. Any pipe or fittings discovered to be defective after laying shall be removed and replaced with a sound piece.
- D. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.
- E. All pipe shall be sound and clean before laying. When laying is not in progress, including lunch time, the open ends of the pipe shall be closed by watertight plugs or other approved means. Good alignment shall be preserved in laying.
- F. Pipe and fittings shall be installed in accordance with the instructions of the manufacturer, ASTM D2321 and as specified herein. As soon as the excavation is complete to normal grade of the bottom of the trench, the specified bedding material shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. The specified haunching material shall be placed evenly on each side of the pipe as shown on the drawings and hand tools shall be used to force the screened gravel under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Initial backfill shall then be placed to 6

inches above the top of the pipe. The final backfill above the initial backfill shall be placed in 8-inch layers and carefully compacted. Generally, the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial three feet of backfill shall be approved by the pipe manufacturer's representative prior to use.

- G. Each length of the pipe shall be shoved home against the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped".
- H. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.
- I. Precautions shall be taken to prevent flotation of the pipe in the trench.
- J. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the select backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, select fill material shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.
- K. Pipe stubs for manhole connections shall not exceed 3.25 feet in length unless directed otherwise by the Engineer. Install caps where required.

3.04 TESTING

- A. Testing and cleaning of pipe shall be as specified in Section 01655.

END OF SECTION

SECTION 15064

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, equipment, materials and incidentals required to install and test all PVC piping, fittings and appurtenances as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Trenching, Backfilling, and Compaction included in Section 02221.
- B. Valves and Appurtenances are included in Division 15100.

1.03 SUBMITTALS

- A. Submit Shop Drawings to the Engineer in accordance with the conditions of the Contract and Section 01340. Shop Drawings shall include a complete laying plan of all pipe with fittings, adapters, valves and specials shown and manufacturer's drawings and Specifications included. All of the above shall be submitted to the Engineer for approval before fabricating and shipping these items. The location of all pipes shall conform to the Contract Drawings. In some cases, however, a certain amount of flexibility in pipe position will be allowed where new pipes connect to existing piping.
- B. Test certificates indicating that the pipe complies with the referenced standard Specifications shall be furnished to the Engineer prior to shipping any material to the job site.

1.04 INSPECTION

- A. All pipe and fittings to be installed under this contract may be inspected at the site of manufacture for compliance with these Specifications by an independent laboratory selected by the Owner. The manufacturer's cooperation shall be required in these inspections. The cost of inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe, will be borne by the Owner.

PART 2: PRODUCTS

2.01 PIPE AND FITTINGS

- A. PVC pipe and appurtenances sixty (60) inches in diameter or less but greater than four (4) inches in diameter shall be "Class" rated pipe meeting the requirements of AWWA C900-2016. Pipe shall be as called for on the Drawings and shall be Class 165, meeting requirements of Dimension Ratio (DR) 25. Each length of pipe shall be hydrotested to four times its class pressure by the manufacturer in accordance with AWWA C900. Pipe shall be listed by Underwriters Laboratories. Provisions shall be made for expansion and contraction of each joint with an elastomeric ring and shall have an integral thickened bell as part of each joint. Pipe shall be furnished in nominal lengths of approximately twenty (20) feet, unless other-wise directed by the Engineer. Pipe and accessories shall bear the NSF mark indicating its approval for potable water, pipe size, manufacturer's name, AWWA and/or ASTM Specification number, working pressure and production code. Pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compound, as described in ASTM D 1784. Pipe furnished shall be as manufactured by Diamond Plastics Corporation, North American Pipe Corporation, Pipe Life Jet Stream, Inc., or approved equal.
- B. All fittings for class-rated PVC pipe shall be cast iron/ductile iron with mechanical joint and shall conform to AWWA C153 for cast iron/ductile iron fittings, unless otherwise directed by the Engineer. Joints shall be furnished complete with cast iron glands, high-strength cast iron alloy teehead bolts, hexagon nuts and rubber gaskets (one per joint) and all necessary joint materials. One extra gasket for every fifty joints or fraction thereof shall be furnished with the pipe and fittings. All bolts for joints shall be "Acipalloy," "Usalloy" or "Corten" bolts. Fittings furnished shall be as manufactured by U.S. Pipe and Foundry, American Cast Iron Pipe, Tyler Pipe or approved equal.
- C. All water service tubing shall be polyethylene SDR-9, CST O.D. The tubing shall comply with ASTM D-2737 and shall be made from material having standard PE Code Designation PE 3408 and carrying NSF approval.
- D. The pipe manufacturer shall supply all polyvinyl chloride accessories as well as any adapters and/or specials required to perform the work as shown on the Drawings and specified herein.

2.02 JOINTS

- A. The PVC joints for pipe shall be of the push-on type so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the fitting socket. Forcing the plain end of the entering pipe into the socket shall compress the gasket radially to the pipe to form a positive seal. The gasket and annular recess shall be designed and shaped so

that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which shall meet requirements of ASTM D 1869. The thickened bell section shall be designed to be at least as strong as the pipe wall. Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material and shall not impart color, taste, or odor to the water.

- B. In addition to the thrust blocking required, M.J. retainer glands (Meg-A-Lugs) shall be used on all 90° bends, 45° bends, and fire hydrants. The restraints shall be the EBAA Iron Series 2000PV. No substitutions will be accepted.
- C. Carrier pipes to be installed inside casings shall be installed with pipe restraints as manufactured by Uni-Flange at all pipe bell joints. This is in addition to the high density polyethylene casing spacers placed every 6 feet as show on the drawings. No substitutions will be accepted.

PART 3: EXECUTION

3.01 HANDLING PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe for fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.
- B. All pipe and fittings shall be subjected to a careful inspection.
- C. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work and when installed or laid, shall conform to the lines and grades required.

3.02 INSTALLATION

- A. The installation of PVC pipe shall be in accordance with UNI-BELL Plastic Pipe Association Guide Specification UNI-B-3-76 and the manufacturer's instructions.
- B. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized by the Engineer, cutting shall be done by means of approved type mechanical cutters.

- C. Placing and Laying: While suspended in the sling and before lowering into the trench, the pipe shall be inspected for defects. Defective, damaged or unsound pipe will be rejected and shall be removed from the site.
- D. Deflections from a straight line or grade, as required by vertical curves, horizontal curves or offsets, shall not exceed $6/D$ inches per linear foot of pipe, where D represents the nominal diameter of the pipe expressed in inches. The Contractor shall provide special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limit set forth, as approved by the Engineer. After placing a length of pipe in the trench, the spigot shall be centered in the bell and pipe pushed into position and then brought into the required alignment. Except where necessary in making connections with other lines, or as authorized by the Engineer, pipe shall be laid with the bells (or sockets) facing in the direction of laying.
- E. Thrust Restraint: Fittings at bends in the pipe line shall be firmly blocked against the undisturbed vertical face of the trench, with concrete blocking and joint restraints as detailed, to prevent the fittings from being blown off the lines when under pressure. If the character of the soil is such that in the opinion of the Engineer the fittings cannot be securely blocked, or if requested by the Contractor and approved by the Engineer, metal harness may be used. Such harness shall be tie rods or clamps of adequate strength to prevent movement. Steel rods or clamps shall be galvanized or otherwise rustproofed or shall be painted with acid-proof paint as directed by the Engineer and shall be encased in polyethylene film when exposed to corrosive soil conditions.

3.03 INSPECTION AND TESTING

- A. All pipelines shall remain undisturbed for twenty-four hours to develop complete strength at all joints. All pipelines shall be subjected to a hydrostatic pressure test as specified herein. All leaks shall be repaired, and lines retested until approved by the Engineer.
- B. After the pipe is laid, the joints completed, and the trench backfilled, sufficiently to prevent flotation and/or buckling under pressure, the newly laid piping or any valved section of piping shall be subjected to a pressure test of 150 pounds per square inch for not less than two hours. The hydrostatic test pressure shall not vary by more than plus or minus 5 psi for the duration of the test. Cracked or defective pipe, fittings, valves, or faulty blocking disclosed in the pressure test shall be replaced by the Contractor with sound elements, and the test shall be repeated until the test results are satisfactory to the Engineer.
- C. At a convenient time after normal working pressure has been on the new pipe or any valved section thereof for at least twenty-four hours, a leakage test under normal operating pressure of 90 psi shall be conducted by the

Contractor in the presence of the Engineer or his authorized representative. The Contractor will furnish gauges, meters, water, and will make all necessary taps at no separate cost to the Owner.

- D. Leakage is defined as the quantity of water supplied into the newly laid pipe line or any valved section thereof necessary to maintain normal working pressure after the test section of the pipe line has been filled with water and the air expelled.
- E. No pipe installation will be accepted until or unless the leakage under normal pressure on any test section is less than the allowable leakage as calculated by the following formula:

$$L = (SD\sqrt{P}) / 133,200$$

where L is the allowable leakage in gallons per hour, S is the length of pipeline tested in feet, D is the nominal diameter of the pipe in inches, and P is the average test pressure during the leakage tests in pounds per square inch gauge. The test pressure shall be 90 psi.

- F. Should any test show a greater amount than the above specified, the Contractor shall, at his own expense, locate and stop leaks until the leakage is reduced to within the specified limits. All observed or otherwise known leaks shall be eliminated regardless of otherwise meeting the test requirements.

3.04 CHLORINATION OF POTABLE WATER PIPELINES

- A. Before being placed in service, all new potable water pipelines shall be chlorinated in accordance with AWWA C651, "Standard Procedure for Disinfecting Water Mains." The approval of the procedure by the Engineer shall be obtained in advance.
- B. The location of the chlorination and sampling points shall be determined by the owner.
- C. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline about 24 hours.
- D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system. Bacteriological sampling and analysis of the replacement water may then be made by the Owner in full accordance with AWWA Specification C601.

Rechlorination will be required, if necessary and the line shall not be placed in service until the requirements of the Texas Natural Resource Conservation Commission are met.

- E. Special disinfecting procedures shall be used in connections to existing mains, and where the method outlined above is not practical.

END OF SECTION

SECTION 15069

JACKING, BORING OR TUNNELING PIPE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to install casing pipe by methods of jacking, boring or tunneling as shown on the plans and in conformity with the specification.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02221: Trenching, Backfilling and Compaction
- B. Section 01665: Trench Safety System
- C. Section 15063: Polyvinyl chloride (PVC) Sewer Pipe

PART 2: PRODUCTS

2.01 MATERIALS FOR CASING

- A. Pipe casing will be steel, pipe of the size, type, and class specified on the plans, or other types as may be specified by the Engineer or designated on the plans.

PART 3: EXECUTION

3.01 JACKING

- A. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. Wherever end trenches are cut in the sides of the embankment or beyond it, such work shall be sheathed securely and braced in a manner satisfactory to the Engineer to prevent earth caving.
- B. Where pipe is required to be installed under railroad embankments or under highways, streets, or other facilities by jacking or boring methods, construction shall be made in such a manner that will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained, as directed by the Engineer, until such time as the backfill has been completed and then shall be removed from the site.

- C. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head, usually of timber and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. A suitable jacking frame or back stop will be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct it in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.
- D. The Contractor shall furnish for the Engineer's approval, a plan showing his proposed method of handling, including the design for the jacking head, jacking support or back stop, arrangement and position of jacks, pipe guides, etc., complete in assembled position. The approval of this plan by the Engineer will not relieve the Contractor from his responsibility to obtain specified results.
- E. The excavation for the underside of the pipe, for at least one third of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe. This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe.
- F. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material but, it shall not exceed 2 feet in any case. This distance shall be decreased on instructions from the Engineer, if the character of the material being excavated makes it desirable to keep the advance excavation closer to the end of the pipe.
- G. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extent of 1 inch in 10 feet, provided that such variation shall be regular and only in one direction and that the final grade of flow line shall be in the direction indicated on the plans.
- H. If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto pipe.
- I. When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.

- J. Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at his entire expense.
- K. The pits or trenches excavated to facilitate jacking operations shall be backfilled immediately after the jacking of the pipe has been completed.

3.02 BORING

- A. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation of shoring shall be as outlined above under "Jacking". The location of the pit shall meet the approval of the Engineer. The holes are to be bored mechanically. The boring shall be done using a pilot hole. By this method an approximate 2 inch pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. This pilot hole shall serve as the centerline of the larger diameter hole to be bored. Excavated material will be placed near the top of the working pit and disposed of as required. The use of water or other fluids in connection with the boring operation will be permitted only to the extent to lubricate cuttings; jetting will not be permitted.
- B. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10 percent of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.
- C. Allowable variation from line and grade shall be as specified under "Jacking". Overcutting in excess of one inch shall be remedied by pressure grouting the entire length of the installation.

3.03 TUNNELING

- A. Where the characteristics of the soil, the size of the proposed pipe, or the use of monolithic sewer, would make the use of tunneling more satisfactory than jacking or boring, or where called for on the plans, a tunneling method may be used.
- B. The excavation for pits and the installation of shoring shall be as outlined above under "Jacking".
- C. The lining of the tunnel shall be of steel of sufficient strength to support the overburden. The Contractor shall submit his proposed liner method to the Engineer for approval. Approval by the Engineer shall not relieve the Contractor of the responsibility for the adequacy of the liner method.

- D. The space between the liner plate and the limits of excavation shall be pressure-grouted or mud-jacked.
- E. Access holes for placing concrete shall be spaced at maximum intervals of 10 feet.

3.04 JOINTS

- A. If corrugated metal pipe is used, joints may be made by field bolting or by connecting bands, whichever is feasible.

3.05 MEASUREMENT & PAYMENT

- A. Jacking, boring, or tunneling pipe will be measured by the linear foot of pipe casing complete in space. Such measurement will be made between the ends of the pipe along the flow line as installed.
- B. The work performed and materials furnished as prescribed by this item will be paid for at the unit price bid per linear foot for "Jacking or Boring Pipe" or "Jacking, Boring or Tunneling Pipe" as the case may be of the type, size, and class specified on the plans which price shall be full compensation for furnishing all materials to include the specified carrier pipe inserted in the casing, pipe liner materials required for tunnel operations, for all preparation, hauling and installing of same, and for all labor, tools, equipment, and incidentals necessary to complete the work.

END OF SECTION

SECTION 15066 PVC FORCE MAINS

PART I - GENERAL

1.01 SCOPE

- A. Under this item the Contractor shall furnish, install and test (PVC) Sanitary Sewer Force Main Pipe and fittings of the size, type, and at the locations shown on the plans or as ordered by the Engineer. Sanitary sewer force main fittings shall be defined as any bends, tees, crosses, reducers, caps, plugs, sleeves, etc., required to complete the force main installations.
- B. All products, installation and testing of force mains and gravity sewers shall meet the requirements of the Texas Commission on Environmental Quality (TCEQ) "Chapter 217 - Design Criteria for Domestic Wastewater Systems, Subchapter C".

1.02 RELATED WORK

- A. Section 01665 Trench Safety Systems
- B. Section 02100 Site Preparation
- C. Section 02221 Trenching, Backfilling, and Compaction.

1.03 SUBMITTALS

- A. Submit Shop Drawings to the Engineer in accordance with the conditions of the Contract and Section 01340. Shop Drawings shall include a complete laying plan of all pipe with fittings, adapters, valves and specials shown and manufacturer's drawings and Specifications included. All of the above shall be submitted to the Engineer for approval before fabricating and shipping these items. The location of all pipes shall conform to the Contract Drawings. In some cases, however, a certain amount of flexibility in pipe position will be allowed where new pipes connect to existing piping.
- B. Test certificates indicating that the pipe complies with the referenced standard Specifications shall be furnished to the Engineer prior to shipping any material to the job site.

PART 2: PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) SANITARY SEWER FORCE MAIN PIPE

- A. Pipe- All Polyvinyl Chloride (PVC) pipe shall be SDR-26 pressure sewer pipe, Class 160 that meets or exceeds all of the requirements of ASTM Specification

D2241 with a maximum hydrostatic working pressure of 160 psi @73°F. Pipes shall be a gasketed joint meeting the requirements of ASTM D3139, and the joint gasket shall conform to the requirements of ASTM F477. The pipe shall be green in color.

- B. Fittings - All fittings shall be C-153 Ductile Iron. All fittings are to be provided with restrained joints. All fittings are to be lined with Protecto 401 Ceramic Epoxy.
- C. Air-vacuum Release Valves - The air-vacuum release valves for use in sanitary sewer force mains shall be installed as shown on the Drawings. The valve body shall be of cast iron ASTM A126-B. The floats, float guide, and stem shall be of stainless steel Type 316. The resilient seat shall be of Buna N. The valve shall be suitable for 150 PSIG working pressure. Valve shall have standard NPT inlets and outlet ports. Provisions shall be made for back-flushing the valve with clean water. Valve shall be manufactured by Val-Matic, APCO or an approved equal.

PART 3 - EXECUTION

3.01: INSTALLATION

- A. Sewer shall not be closer horizontally than 9 feet to a water supply main. If separation cannot be maintained, it shall meet TCEQ Rules set forth in Chapter 217 – Subchapter C.
- B. Pipe Laying:
 - 1. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.
 - 2. Before making pipe joints all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.
- C. Trenches:
 - 1. Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings. Bedding shall be in accordance with Section 02221.
- D. Backfill:

1. As soon as possible after the joint is made sufficient backfill materials shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light. Compaction of backfill shall be in accordance with Section 02221.

E. Handling and Storage:

1. Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations.

END OF SECTION

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SECTION 15100

VALVES AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.
- C. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- D. All exposed valves, where applicable, shall have "open-closed" position indicators. The position indicators shall be conveniently located for easy visibility.
- E. The equipment shall include, but not be limited to, the following:
 - 1. Resilient Seat Gate Valves
 - 2. Plug Valves
 - 3. Valve Stem Extensions
 - 4. Valve Boxes
 - 5. Check Valves
 - 6. Air release valves for sanitary sewer service
 - 7. Air release valves for water service

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Piping is included in the respective Sections of Division 15.

1.03 DESCRIPTION OF SYSTEMS

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water and domestic wastewater.

1.04 QUALIFICATIONS

- A. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.05 SUBMITTALS

- A. Submit to the Engineer within 15 days after execution of the contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with the requirements of the General Conditions.

1.06 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

PART 2: PRODUCTS

2.01 RESILIENT SEATED GATE VALVES

- A. Gate valves shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 of latest revision and in accordance with the following specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- B. The valves are to be non-rising stem with the stem made of cast, forged, or rolled bronze shown in AWWA C509. Two stem seals shall be provided and shall be of the O-ring type, one above and one below the thrust collar. The stem nut, also made of bronze, must be independent of the gate.
- C. The sealing mechanism shall consist of a cast iron gate having a vulcanized synthetic rubber coating. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
- D. The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class B. All ferrous surface inside and outside shall have a fusion-bonded epoxy coating. A handwheel or wrench nut shall be provided for operating the valve. All Valves are to be tested in strict accordance with AWWA C509.

2.02 PLUG VALVES

- A. All valves shall be eccentric plug valves unless otherwise specified. valves shall be as manufactured by DeZurik, Homestead or approved equal.
- B. Plug valves shall be tested in accordance with AWWA C504-80 Section 5. Each valve shall be performance tested in accordance with 5.2 and shall be given a leakage test and hydrostatic test as described in paragraphs 5.3 and 5.4. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in Section 5.5.
- C. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections. Resilient faced plugs relationship to seat shall be externally adjustable. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111-72. Bell ends shall be to the AWWA Standard C100-55 Class B. Screwed ends shall be to the NPT standard.
- D. Valve bodies shall be of ASTM A126 Class B Semi-steel, 31,000 psi tensile strength minimum in compliance with AWWA Standard C507-73, Section 5.1 and AWWA Standard C504-70 Section 6.4. Port areas for valves 4 inch and above shall be 80% port area. All exposed nuts, bolts, springs, washers, etc. shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.
- E. Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with AWWA Standard C507-73 Section 8 paragraphs 8.1, 8.3 and 8.5 and with AWWA Standard C504-70 Section 10.
- F. Seats in 4-inch and larger valves shall have a welded-in overlay of a high nickel content on all surfaces contacting the plug face which comply with AWWA Standard C507-73 Section 7 paragraph 7.2 and with AWWA standard C504-70 Section 9 paragraph 9.4.
- G. Valve shaft seals shall be multiple ring "V-type" adjustable packing and comply with AWWA Standard C507-73 Section 10 and with AWWA C507-70 Section 11.
- H. Valve pressure ratings shall be as follows and shall be established by hydrostatic testing as specified by ANSI Standard B16.1-1967. Pressure ratings shall be 50 psi. Valves shall be capable of providing drip-tight shutoff to the full valve rating with the pressure in either direction.
- I. Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floorstands, etc. as indicated on the plans. All valves 6-inch and larger

shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be zinc or cadmium plated. Valve packing adjustment shall be accessible without disassembly of the actuator.

- J. All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer's recommendations.

2.03 VALVE STEM EXTENSIONS

- A. Extension stems shall be provided as necessary to situate the operating nut no greater than 18 inches below the valve cover.
- B. Extension stems shall be equipped with stem guides affixed to the valve box at intervals not to exceed ten feet.
- C. Stem guides shall be considered a part of the extension. Extension stems and stem guide shall be manufactured items or approved equal.

2.04 VALVE BOXES

- A. All buried valves shall have cast-iron three piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and to extend to such elevation at or slightly above the finished grade surface as directed by the Engineer. The barrel shall be two-piece, sliding type, having 5\-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers. Covers shall have "WATER" cast into the top for all water mains and "SEWER" cast into the top of all wastewater lines. All valves shall have actuating nuts extended to top of valve boxes. Valve boxes shall be provided with concrete base.

2.05 CHECK VALVES

- A. Check valves for cast iron and ductile iron pipelines shall be swing type and shall meet the material requirements of AWWA Specification C508. The valves shall be iron body, bronze mounted, single disc, 150 psi working water pressure, nonshock, and hydrostatically tested at 300 psi. Ends shall be 125 pound ANSI B16.1 flanges or 125 pound ANSI B2.1 threaded fittings depending upon location.

- B. When there is no flow through the line the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.
- C. Check valves shall have bronze seat and body rings, extended bronze hinge pins and bronze nuts on the bolts of bolted covers.
- D. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever.

2.06 AIR RELEASE VALVES

- A. The air-vacuum release valves for use in sanitary sewer force mains shall be installed as shown on the Drawings. The valve body, floats, float guide, and stem shall be of stainless-steel Type 316. The resilient seat shall be of Buna N. The valve shall be suitable for 150 PSIG working pressure. Valve shall have standard NPT inlets and outlet ports. Valve shall be manufactured by DeZurik APCO Model 445, or an approved equal.
- B. A. The air-vacuum release valves for use in waterline shall be installed as shown on the Drawings. The valve body, floats, float guide, and stem shall be of stainless-steel Type 316 and NFS. The resilient seat shall be of Buna N. The valve shall be suitable for 150 PSIG working pressure. Valve shall have standard NPT inlets and outlet ports. Valve shall be manufactured by DeZurik APCO Model 200, or an approved equal.

2.07 SHOP PAINTING

- A. Ferrous surfaces of valves and appurtenances shall receive a coating of rust-inhibitive primer as specified in Section 09865. All pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

PART 3: EXECUTION

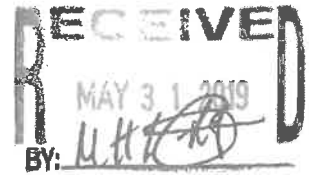
3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.
- B. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections in Division 15.
- C. Flanged joints shall be made with 316 stainless steel bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts

and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.

- D. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and out-side of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- E. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
- F. Air Valve Locations: After the mains have been installed the Contractor shall install the air release valves. The connection to the main shall be by a stainless steel tapping saddle, as shown on the Drawings. These connections to the main shall be at high points and other locations as determined by the Engineer. In order for the Engineer to determine these locations, the Contractor shall submit the as-built elevations of the top of the pipe to the Engineer as soon as possible after the pipe has been installed. Elevations shall be determined at intervals not to exceed 100 feet and at defined breaks in the pipe profile grade. should re-excavation of the main be necessary to install the air release valve connection, cost for this work and subsequent backfill/restoration work cost shall be included in the appropriate lump sum price bid for air release valves.
- H. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

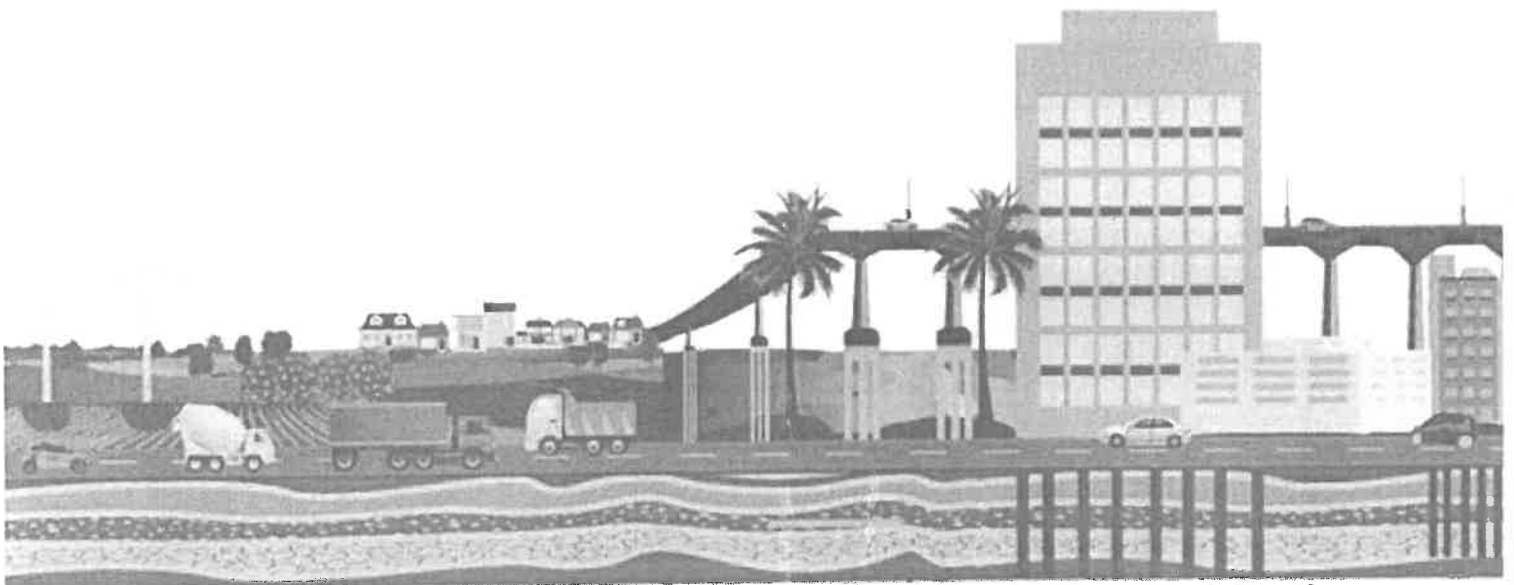
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MEG SOIL BORING LOGS

**PROPOSED
CONWAY LIFT STATION
AT FM-1016 (CONWAY AVENUE)**

MISSION, HIDALGO COUNTY, TEXAS



**Geotechnical Engineering • Construction Materials Engineering & Testing
Environmental • Consulting • Forensics**

**MEG SOIL BORING LOGS
PROPOSED CONWAY LIFT STATION AT FM-1016 (CONWAY AVENUE)
MISSION, HIDALGO COUNTY, TEXAS**

**Prepared For
Mr. Mario A. Reyna P.E.
Melden & Hunt, Inc.**

MEG Report No. 01-19-29149

May 24, 2019



**MILLENNIUM ENGINEERS GROUP, INC.
TBPE FIRM NO. F-3913
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
TEL: 956-702-8500
FAX: 956-702-8140
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May 24, 2019



Mr. Mario A. Reyna, P.E.
Melden & Hunt, Inc.
115 West McIntyre Street
Edinburg, Texas 78541
(956) 381-0981
mario@meldenandhunt.com

**Subject: MEG Soil Borings Logs
MEG Report No. 01-19-29149
Proposed Conway Lift Station at FM-1016 (Conway Avenue)
Mission, Hidalgo County, Texas**

Dear Mr. Reyna:

Millennium Engineers Group, Inc. is pleased to submit the enclosed boring log data along with water table elevations report that was prepared for the above subject project. This report addresses the findings of our engineering study.

We look forward to continuing our involvement in the project by providing construction monitoring during construction.

Thank you for the opportunity to be of service to you in this phase of the project and we would like the opportunity to assist you in the upcoming phases of the project. If you have any questions, please contact our office at the address, telephone, fax or electronic address listed below.



Cordially,
Millennium Engineers Group, Inc.
TBPE Firm No. F-3913

Raul Palma, P.E.
President

The seal appearing on this document was authorized by Raul Palma, P.E. 65656 on May 24, 2019. Alteration of a sealed document without proper notification to the responsible engineer is an offence under the Texas Engineering Practice Act

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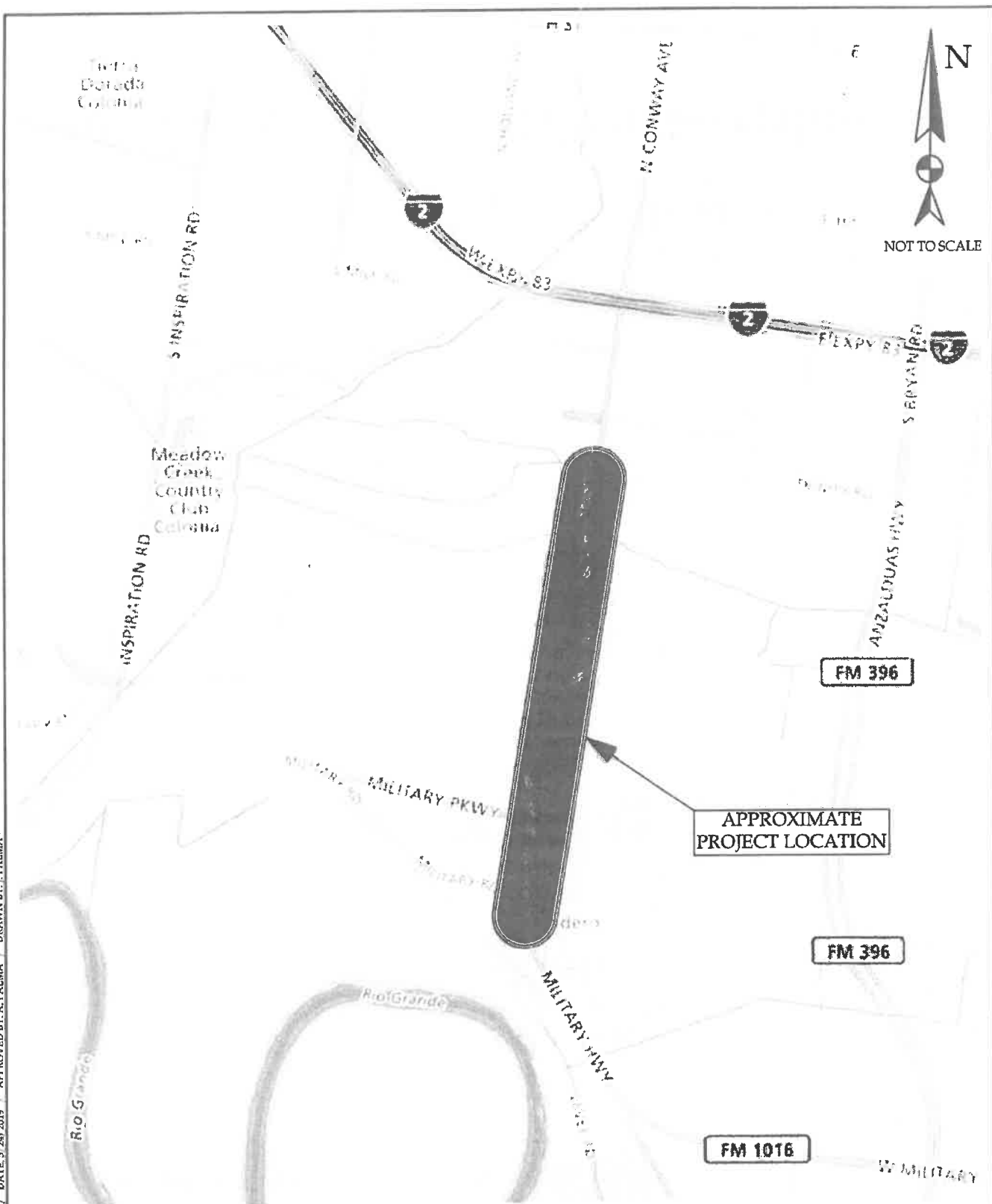
Millennium Engineers Group, Inc.
5804 N. Gumwood Avenue
Pharr, Texas 78577
www.megengineers.com Tel: 956-702-8500 Fax: 956-702-8140

MEG Project No.: 01-19-29149

Page II

Geotechnical Engineering ■ Construction Material Testing ■ Consulting ■ Forensics

MEG PROJECT: 01-19-29149 / DATE: 5/24/2019 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



PROJECT SITE LOCATION MAP

PROPOSED CONWAY LIFT STATION
AT FM-1016 (CONWAY AVENUE)
MISSION, HIDALGO COUNTY, TEXAS



MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
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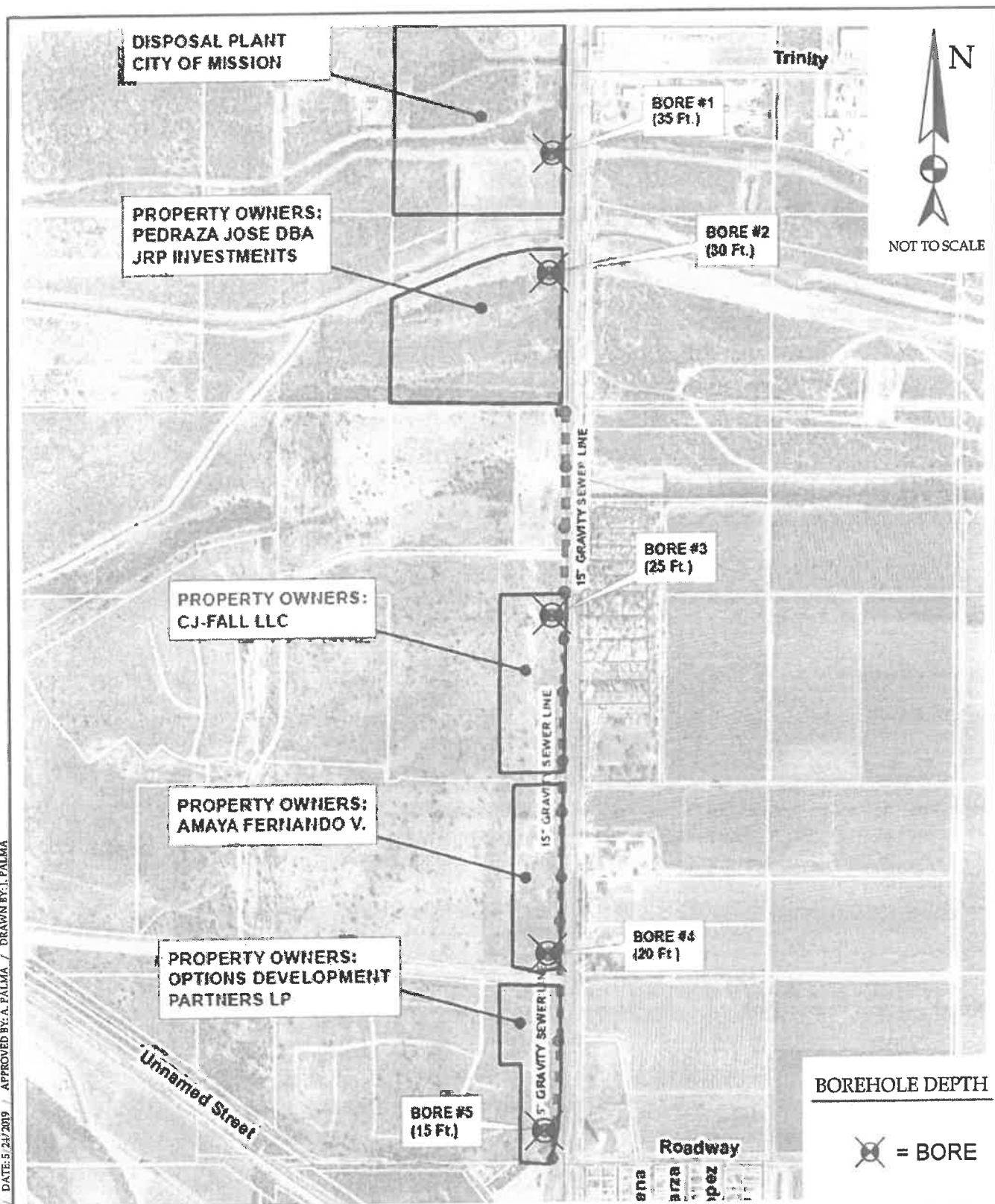
MEG PROJECT: 01-19-29148 / DATE: 5/23/2019 / APPROVED BY: A. PALMA / DRAWN BY: L. PALMA

PROJECT TOPOGRAPHY MAP
 PROPOSED CONWAY SEWER PROJECT
 AT SH-107 (CONWAY AVENUE)
 MISSION, HIDALGO COUNTY, TEXAS



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MEG PROJECT: 01-19-29149 / DATE: 5/24/2019 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



PROJECT BOREHOLE LOCATION MAP

PROPOSED CONWAY LIFT STATION
AT FM-1016 (CONWAY AVENUE)
MISSION, HIDALGO COUNTY, TEXAS



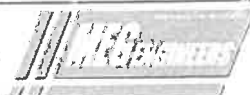
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Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Log of Boring B-1
Sheet 1 of 1

Date(s) Drilled 5/17/2019	Logged By D. Juarez	Checked By Raul Palma
Drilling Method Straight Flight	Drill Bit Size/Type 4" soil bit	Total Depth of Borehole 35 feet bgs
Drill Rig Type CME 45	Drilling Contractor MEG	Approximate Surface Elevation 115 feet Natural Ground (assumed)
Groundwater Level and Date Measured 8 feet ATD, 7 feet after 24 Hrs.	Sampling Method(s) SPT	Hammer Data 140 lb., 30 in. drop, cathead
Borehole Backfill Subgrade Cuttings	Location See Boring Location Map	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
115	0				CH		fat CLAY, dk. brown to brown, moist, stiff to very stiff					
114	1		1	21				24	54	34		
113	2							24				
112	3		2	14				22				
111	4							24				
110	5		3	15				21	54	29		
109	6										99	▼ @ 24 hrs.
108	7		4	11								▼ @ ATD
107	8											Cave in at 9' @ 24 Hrs.
106	9		5	9								
105	10											
104	11											
103	12				CL		lean CLAY with sand, brown, moist, hard					
102	13							24	35	19		
101	14		6	33								
100	15											
99	16											
98	17				SC		clayey SAND, brown, moist to wet, loose to med. dense					
97	18							15	18	4		
96	19		7	7								
95	20											
94	21											
93	22											
92	23											
91	24		8	29				20			32	Cave In at 23' @ ATD
90	25											
89	26											
88	27				CL		sandy lean CLAY, brown, moist to wet, very stiff					
87	28							26			55	
86	29		9	26								
85	30											
84	31											
83	32											
82	33											
81	34		10	30				18			66	
80	35						Bottom of Borehole					
79	36											
78	37											



Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Log of Boring B-2
Sheet 1 of 1

Date(s) Drilled 5/17/2019	Logged By D. Juarez	Checked By Raul Palma
Drilling Method Straight Flight	Drill Bit Size/Type 4" soil bit	Total Depth of Borehole 30 feet bgs
Drill Rig Type CME 45	Drilling Contractor MEG	Approximate Surface Elevation 110 feet Natural Ground (assumed)
Groundwater Level 6 feet ATD, 6 feet after 24 and Date Measured Hrs.	Sampling Method(s) SPT	Hammer Data 140 lb., 30 in. drop, cathead
Borehole Backfill Subgrade Cuttings	Location See Boring Location Map	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
110	0				CH		fat CLAY, dk. brown to brown, moist, stiff to very stiff	14	69	42		
109	1		1	22								
108	2		2	22				18				
107	3		2	22								
106	4		2	22								
105	5		3	11				24			94	▼ @ 24 hrs.
104	6		3	11								
103	7		4	22				23				
102	8		4	22								
101	9		5	21				22	51	33		Cave In at 9' @ 24 Hrs.
100	10		5	21								
99	11		5	21								
98	12		5	21								
97	13		5	21								
96	14		6	21				22			99	
95	15		6	21								
94	16		6	21								Cave In at 16' @ ATD
93	17		7	10	CL		lean CLAY with sand, brown, moist to wet, stiff					
92	18		7	10				31				
91	19		7	10								
90	20		7	10								
89	21		7	10								
88	22		8	12	SC		clayey SAND, brown, moist to wet, med. dense					
87	23		8	12								
86	24		8	12				17	28	12		
85	25		8	12								
84	26		8	12								
83	27		8	12								
82	28		8	12								
81	29		9	18				23			18	
80	30		9	18			Bottom of Borehole					
79	31											
78	32											
77	33											
76	34											
75	35											
74	36											
73	37											



Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Log of Boring B-3
Sheet 1 of 1

Date(s) Drilled 5/16/2019	Logged By D. Juarez	Checked By Raul Palma
Drilling Method Straight Flight	Drill Bit Size/Type 4" soil bit	Total Depth of Borehole 25 feet bgs
Drill Rig Type CME 45	Drilling Contractor MEG	Approximate Surface Elevation 115 feet Natural Ground (assumed)
Groundwater Level 13 ATD, 13 feet after 24 and Date Measured Hrs.	Sampling Method(s) SPT	Hammer Data 140 lb., 30 in. drop, cathead
Borehole Backfill Subgrade Cuttings	Location See Boring Location Map	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
115	0				CH		fat CLAY, dk. brown to brown, moist, stiff to very stiff	21	56	28		
114	1		1	12				21				
113	2		2	12				21				
112	3											
111	4		3	27				19	57	28	99	
110	5											
109	6		4	19				21	66	39		
108	7											
107	8		5	23				22				
106	9											
105	10											
104	11											
103	12				CL		lean CLAY, brown, moist to wet, stiff					
102	13											
101	14		6	9				26	41	22		▼ @ 24 hrs. Cave in at 14' @ 24 hrs @ 15' @ ATD
100	15											
99	16											
98	17											
97	18											
96	19		7	16				24			100	
95	20											
94	21											
93	22											
92	23											
91	24		8	10				28				
90	25						Bottom of Borehole					
89	26											
88	27											
87	28											
86	29											
85	30											
84	31											
83	32											
82	33											
81	34											
80	35											
79	36											
78	37											



Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Log of Boring B-4
Sheet 1 of 1

Date(s) Drilled 5/16/2019	Logged By D. Juarez	Checked By Raul Palma
Drilling Method Straight Flight	Drill Bit Size/Type 4" soil bit	Total Depth of Borehole 20 feet bgs
Drill Rig Type CME 45	Drilling Contractor MEG	Approximate Surface Elevation 115 feet Natural Ground (assumed)
Groundwater Level 11 feet ATD, 10 feet after and Date Measured 24 Hrs.	Sampling Method(s) SPT	Hammer Data 140 lb., 30 in. drop, cathead
Borehole Backfill Subgrade Cuttings	Location See Boring Location Map	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
115	0				CH		fat CLAY, dk. brown to brown, moist, stiff to very stiff	19				
114	1		1	19								
113	2							19	52	27		
112	3		2	20								
111	4							15	58	36		
110	5		3	16								
109	6							21				
108	7		4	9								
107	8							14			82	
106	9		5	4								▼ @ 24 hrs.
105	10											▼ @ ATD
104	11											Cave in at 12' @ 24 Hrs.
103	12				CL		lean CLAY with sand, brown, moist to wet, med. stiff					
102	13											
101	14		6	4				28				
100	15											
99	16											
98	17											
97	18											Cave In at 18' @ ATD
96	19		7	7				28			98	
95	20						Bottom of Borehole					
94	21											
93	22											
92	23											
91	24											
90	25											
89	26											
88	27											
87	28											
86	29											
85	30											
84	31											
83	32											
82	33											
81	34											
80	35											
79	36											
78	37											



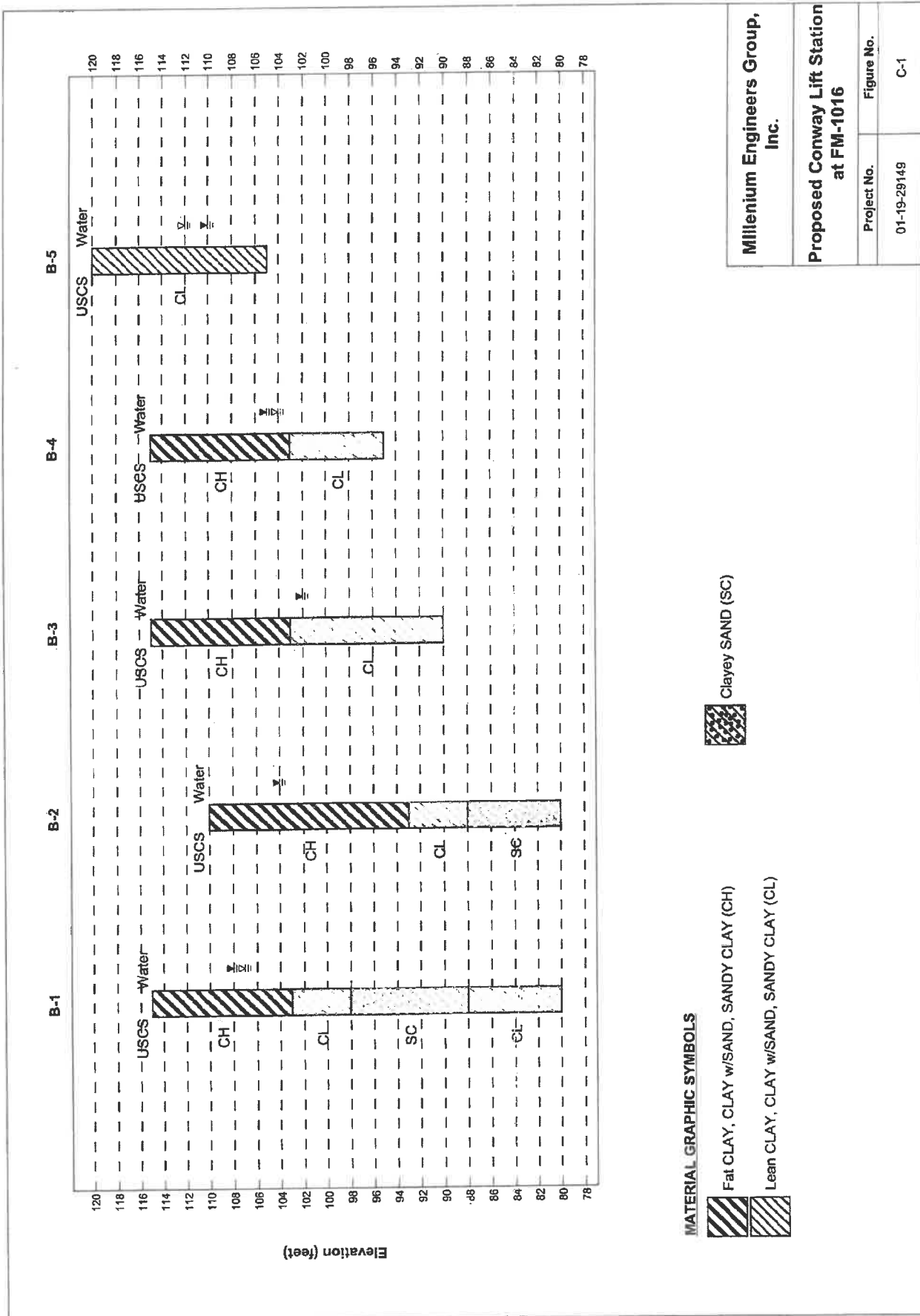
Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Log of Boring B-5
Sheet 1 of 1




Date(s) Drilled 5/16/2019	Logged By D. Juarez	Checked By Raul Palma
Drilling Method Straight Flight	Drill Bit Size/Type 4" soil bit	Total Depth of Borehole 15 feet bgs
Drill Rig Type CME 45	Drilling Contractor MEG	Approximate Surface Elevation 120 feet Natural Ground (assumed)
Groundwater Level 8 feet ATD, 10 feet after 24 and Date Measured Hrs.	Sampling Method(s) SPT	Hammer Data 140 lb., 30 in. drop, cathead
Borehole Backfill Subgrade Cuttings	Location See Boring Location Map	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
120	0				CL		lean CLAY, dk. brown to brown, moist to wet, stiff to very stiff	21	48	23		
119	1		1	16								
118	2		2	10				19				
117	3											
116	4							21			98	
115	5		3	9								
114	6							24	42	16		▽ @ ATD
113	7		4	7								
112	8							25				▽ @ 24 hrs.
111	9		5	14								▽ @ 24 Hrs.
110	10											Cave In at 11'
109	11											@ 24 Hrs.
108	12											Cave In at 13'
107	13											@ ATD
106	14		6	10				28			98	
105	15						Bottom of Borehole					
104	16											
103	17											
102	18											
101	19											
100	20											
99	21											
98	22											
97	23											
96	24											
95	25											
94	26											
93	27											
92	28											
91	29											
90	30											
89	31											
88	32											
87	33											
86	34											
85	35											
84	36											
83	37											





MATERIAL GRAPHIC SYMBOLS

-  Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
-  Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
-  Clayey SAND (SC)

**Millenium Engineers Group,
Inc.**

**Proposed Conway Lift Station
at FM-1016**

Project No.	Figure No.
01-19-29149	C-1

Project: **Proposed Conway Lift Station at FM-1016**
 Project Location: **Mission, Hidalgo County, Texas**
 Project Number: **01-19-29149**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	LL, %	PI, %	Percent Fines	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11	12	13

COLUMN DESCRIPTIONS

- | | |
|---|---|
| <p>1 Elevation (feet): Elevation (MSL, feet).</p> <p>2 Depth (feet): Depth in feet below the ground surface.</p> <p>3 Sample Type: Type of soil sample collected at the depth interval shown.</p> <p>4 Sample Number: Sample identification number.</p> <p>5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.</p> <p>6 Material Type: Type of material encountered.</p> <p>7 Graphic Log: Graphic depiction of the subsurface material encountered.</p> <p>8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.</p> | <p>9 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.</p> <p>10 LL, %: Liquid Limit, expressed as a water content.</p> <p>11 PI, %: Plasticity Index, expressed as a water content.</p> <p>12 Percent Fines: The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.</p> <p>13 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.</p> |
|---|---|

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
 COMP: Compaction test
 CONS: One-dimensional consolidation test
 LL: Liquid Limit, percent

PI: Plasticity Index, percent
 SA: Sieve analysis (percent passing No. 200 Sieve)
 UC: Unconfined compressive strength test, Q_u , in ksf
 WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS



Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)



Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)



Clayey SAND (SC)

TYPICAL SAMPLER GRAPHIC SYMBOLS



Auger sampler



CME Sampler



Bulk Sample



Grab Sample



3-inch-OD California w/ brass rings



2.5-inch-OD Modified California w/ brass liners



Pitcher Sample



2-inch-OD unlined split spoon (SPT)



Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- ▽ Water level (at time of drilling, ATD)
- ▽ Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- ?— Queried contact between strata

GENERAL NOTES

- Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
- Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.



Figure B-1