CONTRACT DOCUMENTS FOR

BID# 25-18 CITY OF KINGSVILLE LOW WATER CROSSING (WEST D. AVE)

2025





PREPARED BY:



INTERNATIONAL CONSULTING ENGINEERS www.icengineers.net

INTERNATIONAL CONSULTING ENGINEERS 100 E. KLEBERG AVE. SUITE 341 KINGSVILLE, TEXAS 78363 Phone: (361) 826-5805 Fax: (361) 826-5806 TBPE FIRM #F-10837

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Technical Specifications



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The technical specifications for the Low Water Crossing (West D. Ave) and related work were prepared under the supervision of Jesus J. Jimenez, P.E. for the City of Kingsville. Alteration or modification of these sealed documents without the authorization of the engineer of record is an offense under the Texas Engineering Practice Act.

NOTICE TO BIDDERS

Sealed proposals, addressed to the City of Kingsville for: Low Water Crossing (West D. Ave)

This project will have a <u>base bid</u> that consists of all costs associated with City of Kingsville Low Water Crossing (West D. Ave) project. The <u>base bid</u> will consist of providing all labor, material, and equipment for the construction of City of Kingsville Low Water Crossing (West D. Ave) project in accordance with the drawings and specifications.

Bids will be received at the office of the City of Kingsville, until <u>2:00 p.m.</u> on <u>May 20, 2025</u>, and then publicly opened and read. Any bid received after closing time will be returned unopened.

City of Kingsville 400 W. King Ave. Kingsville, Texas 78363

A pre-bid meeting is scheduled for <u>10:00 AM, May 12, 2025</u>. The pre-bid meeting will be conducted by the City of Kingsville, will convene at 400 W. King Ave. Kingsville, Texas 78363.

A bid bond in the amount of 5% of the highest amount bid must accompany each proposal. Failure to provide the bid bond will constitute a non-responsive proposal which will not be considered. Failure to provide required performance and payment bonds for contracts over \$25,000.00 will result in forfeiture of the 5% bid bond to the City of Kingsville as liquidated damages. Bidder's plan deposit is subject to mandatory forfeiture to the City of Kingsville if bidding documents are not returned to the City of Kingsville within two weeks of receipt of bids.

Plans, proposal forms, specifications and contract documents may be procured from the Engineer upon a deposit of <u>One Hundred and no/100</u> Dollars (<u>\$100.00</u>) as a guarantee of their return in good condition within two weeks of bid date. Documents can be obtained by mail upon receipt of an additional (<u>\$25.00</u>) which is a non-refundable postage/handling charge.

The bidder is hereby notified that the owner has ascertained the wage rates which prevail in the locality in which this work is to be done and that such wage scale is set out in the contract documents obtainable at the office of the Engineer and the Contractor shall pay not less than the wage rates so shown for each craft or type of "laborer," "workman," or "mechanic" employed on this project.

The City of Kingsville reserves the right to reject any or all bids, to waive irregularities and to accept the bid which, in the City of Kingsville's opinion, seems most advantageous to the City of Kingsville and in the best interest of the public.

City of Kingsville

Rutilio P. Mora Jr. PE City Engineer PROPOSAL FORM

FOR

CITY OF KINGSVILLE

LOW WATER CROSSINGS (WEST D. AVE)

PROPOSAL

					Place:							
		Date:								_		
Proposal of_								3 1 1 1 1 3	_,			
	а	Corporation	organize	ed and	existing	under	the	laws	of	the	State	of
				·								
OR												
	а	Partners	hip	or	Individu	al	doing]	bu	sines	S	as
						<u></u>						<u></u>
						1 1 1 1 1 1 1	·					

TO: CITY OF KINGSVILLE

Gentlemen:

The undersigned hereby proposes to furnish all labor and materials, tools, and necessary equipment, and to perform the work required for:

CITY OF KINGSVILLE

LOW WATER CROSSINGS (WEST D. AVE)

at the location described by the contract documents and in strict accordance with the contract documents for the following prices, to-wit:

Base Bid

ITEM	DESCRIPTION		QTY.	UNIT COST	TOTAL
A1	MOBILIZATION / BONDS / INSURANCE		1	\$	\$
A2	TRAFFIC CONTROL		1	\$	\$
A3	UTILITY ADJUSTMENT	LS	1	\$	\$
A4	SWPPP (SEDIMENT CONTROL FENCE)	LF	30	\$	\$
A5	SWPPP (BALED HAY)	LF	15	\$	\$
A6	REMOVE EXISTING RAIL	LF	70	\$	\$
A7	REMOVE EXISTING DECK CONCRETE	SY	48	\$	\$
A8	REMOVE SECTION OF EXISTING		10	\$	\$
	CONCRETE RIP RAP				
A9	REMOVE EXISTING CONCRETE RIP RAP	SY	20	\$	\$
A10	REMOVE SECTION OF EXISTING 42" Ø RCP	LF	40	\$	\$
A11	REPAIR EXISTING DECK CONCRETE	SY	48	\$	\$
A12	CONCRETE RIP RAP	SY	240	\$	\$
A13	CONCRETE COLLAR	EA	5	\$	\$
A14	ROCK RIP RAP	SY	88	\$	\$
A15	REGRADE EXISTING TRANQUITAS CREEK	SY	158	\$	\$
A16	42ӯ RCP	LF	40	\$	\$
A17	RAIL	LF	70	\$	\$
A18	WATER GAUGE	EA	2	\$	\$
A19	REMOVE EXISTING WATER GAUGE	EA	1	\$	\$
		то	TAL	\$	\$

PROJECT DESCRIPTION

Project consists of removing and replacing damaged outfall portion of Low Water Crossing at West D. Ave

The undersigned hereby declares that he has visited the site and has carefully examined the documents, specifications and contract documents relating to the work covered by his bid or bids, that he agrees to do the work, and that no representations made by the City of Kingsville are in any sense a warranty but are mere estimates for the guidance of the Contractor.

Upon notification of award of contract, we will within ten (10) calendar days execute the formal contract for the faithful performance of this contract and a Performance and/or Payment Bond (if required by the City of Kingsville) to insure payment for all labor and materials.

Number of Signed Sets of Documents: The contract and all bonds (if required) will be prepared in not less than four counterpart (original signed) sets.

Time of Completion: The undersigned agrees to complete the work within <u>90</u> <u>calendar days</u> from the date designated by a Work Order.

The undersigned further declares that he will provide all necessary tools and apparatus, do all the work and furnish all materials and do everything required to carry out the above mentioned work covered by this proposal, in strict accordance with the contract documents and the requirements pertaining thereto, for the sum or sums above set forth.

Receipt of the following addenda is acknowledged (addenda number):

Respectfully submitted:
Name:
By:
(P.O. Box) (Street)
(City) (State) (Zip) Telephone:

(SEAL - IF BIDDER IS a Corporation)

NOTE: Do not detach bid from other papers. Fill in with ink and submit complete with attached papers.

BID BOND

KNOW ALL MEN BY THESE PRESENTS: That we the undersigned,	
as Pl	RINCIPAL,
and as Suret	y, are held
and firmly bound unto the City of Kingsville, hereinafter called CITY, in the per-	nal sum of
Dollars (\$), lav	wful money
of the United States, for the payment of which sum well and truly to be made, we bind ou	rselves, our
	1 41
heirs, executors, administrators, successors, and assigns, jointly and severally, firml	y by these

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas the Principal has submitted the accompanying Bid, dated the _____ day of _____, 2025, which is hereto attached and made a part hereof for:

LOW WATER CROSSING (WEST D. AVE) KINGSVILLE, TEXAS

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within thirty (60) days after the said opening, and shall within the period specified therefore, or if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into written Contract with the CITY in accordance with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract, or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said Bid and the amount for which the CITY may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

BID BOND PAGE 1 OF 3

IN WITNESS WHEREOF, the above-bound Parties have executed this instrument under their several seals this _____ day of ______, 2025. The Name and Corporate seal of each Corporate Party hereto affixed and these presents signed by its undersigned representative, pursuant to authority of its Governing Body.

ATTEST:

(Principal) Secretary	Principal
(SEAL)	
	Business Address
Witness as to Principal	
	-
Business Address	

BID BOND PAGE 2 OF 3

ATTEST:

(Surety) Secretary	Surety	
(SEAL)	Ву:	Attorney-in-Fact
		Address
	_	
Witness as to Surety		
Address		
Attorney-in-fact, State		

(Power-of-Attorney for person signing for Surety Company must be attached to bond).

BID BOND PAGE 3 OF 3

PAYMENT BOND

State of Texas §		
County of Kleberg	§	KNOW ALL MEN BY THESE PRESENTS
That we,		Contractor, as Principal, and
		, as Surety, are hereby held and firmly
bound unto City of	Kingsv	ville, (hereinafter referred to as "CITY") in the full and just sum
of		<u>.</u>
(\$	_) for	the payment of which the said Principal and Surety bind
themselves, their h	ieirs, ex	ecutors, administrators, successors and assigns, jointly and
severally, firmly by	these p	resents.
The conditions of t	his oblig	gation are such that: WHEREAS the Principal entered into a
certain Contract, wh	nich Co	ntract is hereby referred to and made a part hereof as fully and
to the same exten	nt as if	copied at length herein, with the CITY, dated this day of
, 20)25, for	the project consisting of:

LOW WATER CROSSING (WEST D. AVE)

In accordance with the Drawings, Specifications and other Contract Documents thereto, prepared by International Consulting Engineers (ICE).

NOW, THEREFORE, if the Principal shall promptly make payment to all claimants as defined in Paragraph C of Article 5160 Revised Civil Statutes of Texas, 1925, as amended by House Bill 344, Acts of the 56th Legislature, Regular Session, 1959, supplying labor and materials in the prosecution of the work provided for in said Contract, as well as any changes, extensions, deletions or modifications thereof which may be made by CITY, with or without notice to Surety, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED that any additions, deletion, alterations or changes which may be made in the terms of the Contract or in the Drawing, Specification or other Contract Documents, or in the work to be done thereunder, or the making by the CITY of any payment or pre-payment under Contract, or the giving by the CITY of ant extension of time for the performance of the Contract, or the granting of any other forbearance on the part of either the CITY or the Principal to the other shall not in any way release the Principal or the Surety, or either of them, their heirs, executors, administrators, successors or assigns, from their liability or the liability of any of them hereunder, notice to the Surety of any such addition, deletion, alteration, change, payment, pre-payment, extension or forbearance being hereby expressly waived.

PROVIDED FURTHER, that this bond is executed solely for the protection of the RIDC pursuant to the provisions of Article 5160, Vernon's Civil Statues of Texas, as amended, and all liabilities on this bond are to be determined in accordance with the provisions thereof.

EXECUTED on	, 2025
PRINCIPAL (CONTRACTOR)	SURETY (Corporate Name)
Ву:	Ву:
ATTEST:	ATTEST:
By: Principal	By: Surety

PERFORMANCE BOND

State of Texas §						
County of Kleberg	§	KNOW ALL MEN		DI THESE PRESENT		
That we,		Contractor, as	Principal, and			
		, as Surety	, are hereby held	l and fi	irmly	
bound unto City of Kingsville, hereinafter referred to as "Owner", in the full and just sum						
of		(\$)	for	the	
payment of which the said Principal and Surety bind themselves, their heirs, executors,						
administrators, successors and assigns, jointly and severally, firmly by these presents.						
The conditions of this obligation are such that: WHEREAS, the Principal entered into a						
certain, which Contract is hereby referred to and made a part hereof as fully and to the						
same extent as if copied at length herein, with the Owner, dated this day of						
, 2025, for	the project cor	nsisting of:				

LOW WATER CROSSING (WEST D. AVE)

In accordance with the Drawings, Specifications and other Contract Documents thereto, prepared by International Consulting Engineers.

NOW, THEREFORE, if the Principal shall promptly make payment to all claimants as defined in Paragraph C of Article 5160 Revised Civil Statutes of Texas, 1925, as amended by House Bill 344, Acts of the 56th Legislature, Regular Session, 1959, supplying labor and materials in the prosecution of the work provided for in said Contract, as well as any changes, extensions, deletions or modifications thereof which may be made by Owner, with or without notice to Surety, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED that any additions, deletion, alterations or changes which may be made in the terms of the Contract or in the Drawing, Specification or other Contract Documents, or in the work to be done thereunder, or the making by the Owner of any payment or pre-payment under Contract, or the giving by the Owner of any extension of time for the performance of the Contract, or the granting of any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal or the Surety, or either of them, their heirs, executors, administrators, successors or assigns, from their liability or the liability of any of them hereunder, notice to the Surety of any such addition, deletion, alteration, change, payment, pre-payment, extension or forbearance being hereby expressly waived.

PROVIDED FURTHER, that this bond is executed solely for the protection of the

Owner pursuant to the provisions of Article 5160, Vernon's Civil Statues of Texas, as amended, and all liabilities on this bond are to be determined in accordance with the provisions thereof.

EXECUTED on	, 2025
PRINCIPAL (CONTRACTOR)	SURETY (Corporate Name)
Ву:	Ву:
ATTEST:	ATTEST:
By: Principal	By: Surety

CERTIFICATE AS TO CORPORATE PRINCIPAL

l,	, certify
that I am the	Secretary of the
Corporation named as Principal in the attached Bond; that who	signed the said
Bond on behalf of the Principal was then the	of said
Corporation; that I know his signature and his signature thereto	is genuine; and
that said Bond was duly signed, sealed and attested for and	in behalf of said
Corporation by authority of the governing body.	

(Signed)

Title:_____

Date:_____

(Affix Corporate Seal)

ATTORNEY'S REVIEW CERTIFICATION

I, the undersigned,	, the duly authorized
---------------------	-----------------------

and Acting Legal Representative of the _____

, do hereby certify as follows:

I have examined the attached Contract(s) and Surety Bonds and am of the opinion that each of the Agreements may be duly executed by the proper parties, acting through their duly authorized Representatives; that said Representatives have full power and authority to execute said Agreements on behalf of the respective parties; and that the Agreements shall constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Attorney's Signature

Date

Printed Attorney's Name

ATTORNEY'S REVIEW CERTIFICATION Page 1 of 1

AGREEMENT

State of Texas §

County of Kleberg §

This agreement made and entered into this _____ day of _____, 2025, by and between _____, a corporation organized and existing under the laws of the State of Texas, hereinafter called "Contractor" and City of Kingsville, hereinafter called "CITY".

WITNESSETH, that the Contractor and the CITY. for the considerations stated herein mutually agree as follows:

ARTICLE I STATEMENT OF WORK

The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment and services, including utility and transportation services, and perform and complete all work required for the Project, namely **LOW WATER CROSSING** (WEST D. AVE) and required supplemental work for the project, all in strict accordance with the Contractual Documents, including all Addenda thereto, as prepared by International Consulting Engineers (ICE).

ARTICLE II ENGINEER

INTERNATIONAL CONSULTING ENGINEERS, 261 Saratoga Blvd., Corpus Christi, TX 78417, or his authorized representative, is hereinafter called "ENGINEER" and is to act as City of Kingsville representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE III THE CONTRACT PRICE

The CITY will pay the Contractor for the performance of the Contract in current funds, for the total quantities of work performed at the prices stipulated on his Proposal form of this Contract Document for the several respective items of work in the amount of

_____ (\$_____) completed subject to additions, deletions, and/or revisions as provided in the General Conditions of Agreement included in these Contract Documents.

ARTICLE IV CONTRACT TIME

The Work will be substantially completed within <u>90</u> working days after the date stated in the Notice to Proceed. For each calendar day that any work remains incomplete after the time specified in the Contract for completion of work or after such time period as extended pursuant to other provisions of this Contract, <u>\$200</u> per calendar day will be assessed against the Contractor as liquidated damages. Said liquidated damages are not imposed as a penalty but as an estimate of the damages that the CITY will sustain from delay in completion of the work, which damages by their nature are not capable of precise proof. The assigned CITY representative (Engineer) may withhold and deduct from monies otherwise due the Contractor the amount of liquidated damages due the CITY.

ARTICLE V CONTRACT

The Executed Contract Documents shall consist of the following:

- 1. This Agreement
- 2. Signed Copy of Proposal
- 3. Advertisement for Bids
- 5. Standard General Conditions
- 7. Special Conditions
- 9. Drawings

- 4. Instructions to Bidders
- 6. Supplemental General Conditions
- 8. Technical Specifications
- 10. Addenda

THIS AGREEMENT, together with the other documents enumerated in ARTICLE V, which said other documents are fully a part of the Contract as if hereto attached or herein repeated, forms the Contract. In case of conflicts with any provision of any other component part, the provision of the component part first enumerated in this ARTICLE V shall govern, except as otherwise specifically stated.

RETAINAGE in the amount of ten percent (10%) shall be withheld on all Partial Payments until Completion and Final Acceptance of the work by the CITY.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in three (3) original copies on the day and year first above written.

CITY	CONTRACTOR
Ву:	Ву:
Title:	Title:
ATTEST	
Ву:	Ву:
Title:	Title:

CONTRACTOR'S CERTIFICATION

(Seal)

I, certify that I am the ______ of the corporation named as Contractor herein; that, who signed this Agreement on behalf of the Contractor was then ______ of said corporation, that said Agreement was duly signed for and on behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

CONTRACTOR:		
Ву:		
Business Address:		

Statement of Bidder's Qualifications

<u>This statement must be notarized</u>. All questions must be answered, and the data given must be clear and comprehensive. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information it desires.

List all other names under which your business has operated in the last 10 years:

Work Presently Under Contract:

Contract	\$ Amount	Completion Date

Attach additional sheets if necessary

Type of work performed by your company:

Total Staff employed by Firm (Include breakdown by Managers and Trades on separate sheet):

Have you ever failed to complete any work awarded to you? (If yes, please attach summary on a separate sheet. Include brief explanation of cause and resolution) □ Yes □ No

Have you ever defaulted on a contract? (If yes, please attach summary of details on a separate sheet.) □ Yes □ No

Has your organization had any disbarments or suspensions that have been imposed in the past five years or that was still in effect during the five-year period or is still in effect? (*If yes, list and explain; such list must include disbarments and suspensions of officers, principals, partners, members, and employees of your organization.*)

 \Box Yes \Box No

List the projects most recently completed by your firm (include project of similar importance):

Project	\$ Amount	Month/Year Completed

Attach additional sheets if necessary

Major equipment available for this contract:

Are you in compliance with all applicable EEO requirements? (If no, please attach details on separate sheet.)

 \Box Yes \Box No

(Optional) Minority Business Reporting Information:

Owner's Race:	
Owner's Ethnicity:	
Owner's Gender:	

Are you a Section 3 business? □ Yes □ No Section 3 Business Concerns:

- a) Businesses that are 51 percent or more owned by Section 3 residents;
- b) Businesses whose permanent, full-time employees include persons, at least 30 percent of whom are currently Section 3 residents, or within three years of the date of first employment with the firm were Section 3 residents;
- c) Businesses that provide evidence of a commitment to subcontract in excess of 25 percent of the dollar amount of all subcontracts to be awarded to businesses that meet the qualifications described above; or
- d) Businesses located within the Grant Recipient's jurisdiction that identifies themselves as Section 3 Business Concerns because they provide economic opportunities for low- and very low-income persons.

Bank References

Address:		Contact Name:					
City	&	State:		Zip:		_Phone	Number:
Cred	it ava	ailable: \$					

Has the firm or predecessor firm been involved in a bankruptcy or reorganization? (*If yes, please attach summary of details on a separate sheet.*)

 \Box Yes \Box No

Additional Attachments

List on a sheet attached hereto all judgements, claims, arbitration proceedings, or suits pending or outstanding against bidder over the last five (5) years with amount of claim and brief description.

List on a sheet attached hereto all lawsuits or requested arbitration with regard to construction contracts which bidder has initiated within the last five (5) years and brief explanation of claim and outcome.

Attach resume(s) for the principal member(s) of your organization, including the officers as well as the proposed superintendent for the project.

Signed this _____ day of _____, 20____.

Signature

Printed Name and Title

Company Name

Notary Statement:

______. being duly sworn, says that he/she is the _____Position/Title ______of ______ (Firm Name), and hereby swears that the answers to the foregoing questions and all statements therein contained are true and correct. He/she hereby authorizes

and requests any person, firm, or corporation to furnish any information requested City of _______ in verification of the recitals comprising this Statement of Bidder's Qualifications.

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

Signature of Notary Public

Printed Name

My Commission Expires: _____,

The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

CONFLICT OF INTEREST QUESTIONNAIRE	FORM CIQ
For vendor doing business with local governmental entity	
This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.	OFFICE USE ONLY
This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).	Date Received
By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.	
A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.	
I Name of vendor who has a business relationship with local governmental entity.	
2 Check this box if you are filing an update to a previously filed questionnaire. (The law re completed questionnaire with the appropriate filing authority not later than the 7th busines you became aware that the originally filed questionnaire was incomplete or inaccurate.)	equires that you file an updated as day after the date on which
³ Name of local government officer about whom the information is being disclosed.	
Name of Officer	
A Describe cash employment or other business relationship with the local reversement off	icar or a family member of the
officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship wi Complete subparts A and B for each employment or business relationship described. Attac CIQ as necessary.	th the local government officer. In additional pages to this Form
A. Is the local government officer or a family member of the officer receiving or other than investment income, from the vendor?	ikely to receive taxable income,
Yes No	
B. Is the vendor receiving or likely to receive taxable income, other than investmen of the local government officer or a family member of the officer AND the taxable local governmental entity?	t income, from or at the direction income is not received from the
Yes No	
5 Describe each employment or business relationship that the vendor named in Section 1 n other business entity with respect to which the local government officer serves as an o ownership interest of one percent or more.	naintains with a corporation or officer or director, or holds an
6 Check this box if the vendor has given the local government officer or a family member as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.	of the officer one or more gifts 003(a-1).
7	
Signature of vendor doing business with the governmental entity	Date

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

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

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

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

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

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

(2) the vendor:

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

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

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

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

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

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

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

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

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

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

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

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

(1) the date that the vendor:

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

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

(2) the date the vendor becomes aware:

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

- (B) that the vendor has given one or more gifts described by Subsection (a); or
- (C) of a family relationship with a local government officer.

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of Texas

County of _____)

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

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

(2) He/She 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 another Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from 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 an overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the ______ (Local Public Agency) 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.

Low Water Crossing (West D Ave) Technical Specifications

Prepared For:



City of Kingsville 400 W King Ave, Kingsville Tx 78363 **Prepared By:**



100 E. Kleberg Ave. Suite 341 Kingsville, Tx 78363 TBPE FIRM #F-10837

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SECTION 01040 PROJECT COORDINATION

1. GENERAL

1.1 SUMMARY

- A. This section specifies administrative and supervisory requirements necessary for project coordination including but not necessarily limited to:
 - 1. Coordination.
 - 2. Administrative and supervisory personnel.
 - 3. General installation provisions.
- B. Progress meetings, coordination meetings, and pre-installation conferences are included in Section 01200, Project Meetings.
- C. Requirements for the Contractors construction schedule are included in Section 01300, Submittals.

1.2 COORDINATION

- A. Coordination: Coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service, and, repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Prepare memoranda for distribution to each involved party outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.

- 4. Progress meetings.
- 5. Project closeout activities.

1.3 SUBMITTALS

Within 10 days of the Notice to Proceed, the Contractor will submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the site; provide a proposed organizational chart identifying individuals, their duties and responsibilities; and list the proposed staffs addresses and telephone numbers.

1.4 GENERAL INSTALLATION PROVISIONS

- A. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations if those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.
- B. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- C. Recheck measurements and dimensions before starting installation procedure.
- D. Install each component during weather conditions and at the point in project sequence that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- E. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

1.5 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Heavy traffic.
 - 4. Vibration from adjacent activity.
 - 5. Erosion.
 - 6. Damage by contact with construction equipment.

2. PRODUCTS

(Not Used)

3. EXECUTION

(Not Used)

4. MEASUREMENT & PAYMENT

(Not Used)

END OF SECTION

SECTION 01090 DEFINITIONS AND STANDARDS

1. GENERAL

1.1 SUMMARY

- A. This section specifies administrative requirements for compliance with governing regulations, codes, and standards.
- B. Requirements include obtaining permits, licenses, inspections, releases, and similar documentation as well as payments, statements, and similar requirements associated with regulations, codes, and standards.

1.2 DEFINITIONS

- A. General: Definitions contained in this article are not necessarily complete but are general to the extent that they are not defined more explicitly elsewhere in the Contract Documents.
- B. Indicated: Indicated refers to graphic representations, notes, or schedules on the drawings; other paragraphs or schedules in the specifications; and similar requirements in the Contract Documents. Where terms such as shown, noted, and specified are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
- C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Engineer, requested by the Engineer, interpreted to extend the Engineers responsibility into the Contractors area of construction supervision.
- D. Approved: The term approved, where used in conjunction with the Engineers action on the Contractors submittals, applications, and requests, is limited to the responsibilities and duties of the Engineer stated in the General and Special Conditions. Such approval will not release the Contractor from responsibility to fulfill Contract Document requirements unless otherwise provided in the Contract Documents.
- E. Regulations: The term regulations include laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction as well as rules, conventions, and agreements within the construction industry that control performance of the work, whether they are lawfully imposed by authorities having jurisdiction or not.
- F. Furnish: The term furnish is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term install is used to describe operations at the project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, and finishing, curing, protecting, cleaning, and similar operations.

- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer: An installer is an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- J. Project Site: That space made available by the Engineer to the Contractor for performance of the work either exclusively or in conjunction with others performing other construction as part of the project. The overall extent of the project site is shown on the drawings.
- K. Testing Laboratories: A testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, interpret results of those inspections or tests.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards:
 - 1. Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.
 - 2. Referenced standards take precedence over standards that are not referenced but recognized in the construction industry as standard practice.
- B. Publication Dates: Where compliance with an industry standard is required, comply with the standard in effect as of the date of the Contract Documents.
- C. Conflicting Requirements:
 - 1. Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced unless the Contract Documents indicate otherwise. Refer requirements that are different but apparently equal and uncertainties as to which level is more stringent to the Engineer for a decision before proceeding.
 - 2. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified will be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values as noted or appropriate for the context of the requirements. Refer instances of uncertainty to the Engineer for decision before proceeding.

- D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are listed but not included with the Contract Documents. Also refer to paragraph 1.03-A-1.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the specifications or other Contract Documents they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

2. PRODUCTS

(Not Used)

3. EXECUTION

(Not Used)

4. MEASUREMENT & PAYMENT

(Not Used)

END OF SECTION
SECTION 01200 PROJECT MEETINGS

1. GENERAL

1.1 SUMMARY

- A. This section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Preconstruction conferences.
 - 2. Pre-installation meetings.
 - 3. Coordination meetings.
 - 4. Progress meetings.
- B. Construction schedules are specified in Section 01300, Submittals.

1.2 PRECONSTRUCTION CONFERENCE

- A. A preconstruction conference and organizational meeting will be scheduled by the Engineer at the project site or other convenient location no later than 10 days after execution of the Agreement and prior to commencement of construction activities. The meeting will be conducted to review responsibilities and personnel assignments with the Engineer and the Contractor.
- B. Attendees: The Engineer, Contractor, and subcontractors will each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule.
 - 2. Critical working sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions.
 - 5. Procedures for processing applications for payment.
 - 6. Distribution of Contract Documents.
 - 7. Submittal of shop drawings, product data, and samples.
 - 8. Preparation of record documents.
 - 9. Use of the premises.
 - 10. Office, work, and storage areas.
 - 11. Equipment deliveries and priorities.
 - 12. Safety procedures.
 - 13. First aid.
 - 14. Security.
 - 15. Housekeeping.
 - 16. Working hours.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation meetings may be held prior to beginning installation of critical work items. These items include:
 - 1. Steel sheet pile installation.
 - 2. Concrete repair.
- B. These meetings will be attended by all persons involved in the supervision, inspection, and quality control of this work. Those required to attend are as follows:
 - 1. Engineer.
 - 2. Contractor's project manager and superintendent.
 - 3. Subcontractor's superintendent.
 - 4. Crew foremen.
- C. Agenda will include:
 - 1. Layout, horizontal and vertical control, etc.
 - 2. Equipment and materials required.
 - 3. Specific methods to be used for installation.
 - 4. Review of applicable specifications.
- 1.4 COORDINATION MEETINGS
 - A. The Engineer reserves the right to schedule and conduct coordination meetings at his option.
 - B. The Contractor will conduct coordination meetings with his subcontractors; however, the Engineer will be invited to such meetings.
 - C. Agenda: Review and solve operational conflicts between subcontractors, suppliers, and/or Owner operations.

1.5 PROGRESS MEETINGS

- A. The Engineer reserves the right to schedule and conduct weekly meetings at his option.
- B. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
- C. Contractors Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractors construction schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

- D. Review the present and future needs of each entity present including such items as:
 - 1. Interface requirements.
 - 2. Time.
 - 3. Sequences.
 - 4. Site utilization.
 - 5. Hours of work.
 - 6. Hazards and risks.
 - 7. Housekeeping.
 - 8. Quality and work standards.
 - 9. Change orders.
 - 10. Documentation of information for payment requests.
- E. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

2. PRODUCTS

(Not Used)

3. EXECUTION

(Not Used)

4. MEASUREMENT & PAYMENT

(Not Used)

SECTION 01300 SUBMITTALS

1. GENERAL

1.1 SUMMARY

This section specifies administrative and procedural requirements for submittals required for performance of the work, including:

- A. Contractors partial payment and construction schedule.
- B. Submittal schedule.
- C. Shop drawings.
- D. Product data and mill certificates.

1.2 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchase, testing, delivery, other submittals, and related activities that require sequential activities.
 - 2. Processing:
 - a. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals (including time for resubmittals).
 - b. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Provide a space approximately 4" x 5" on the label or beside the title block on shop drawings to record the Contractors review and approval markings and the action taken.
 - 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.

- c. Name of Engineer.
- d. Name of Contractor.
- e. Name of subcontractor.
- f. Name of supplier.
- g. Name of manufacturer.
- h. Number and title of appropriate specification section.
- i. Drawing number and detail references as appropriate.

1.3 CONTRACTORS PARTIAL PAYMENT AND CONSTRUCTION SCHEDULE

Schedule: Prepare a fully developed construction schedule, preferably a computer based CPM type, but a Gantt chart as a minimum. Submit within 10 days of issuance of the Notice to Proceed. The schedule will include the following:

- A. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities, including minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.
- B. Prepare the Contractors construction schedule with the schedule of values, list of subcontractors, submittal schedule, progress reports, schedule of anticipated monthly partial payment requests, and all other schedules.
- C. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineers procedures necessary for certification of Substantial Completion.

1.4 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractors construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractors construction schedule.
 - 1. Coordinate submittal schedule with the list of subcontractors, schedule of values, and the list of products as well as the Contractor's construction schedule.
 - 2. Prepare the schedule in chronological order; include all submittals required during construction. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related section number.
 - c. Submittal category.
 - d. Name of subcontractor.
 - e. Description of the part of the work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for Engineers final release or approval.

- B. Distribution:
 - 1. Following response to initial submittal, print and distribute copies to the Engineer, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
 - 2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with each meeting report.

1.5 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis for shop drawings. Standard information prepared without specific reference to the project is not considered shop drawings. Reproductions of the Contract Documents will be immediately rejected for resubmittal.
- B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- C. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit shop drawings on sheets at least 8-1/2" x 11", but no larger than 24" x 36".
- D. Final Submittal: Submit one set of sepias and two blue- or black-line prints; submit six prints where required for maintenance manuals.

1.6 PRODUCT DATA

Collect product data into a single submittal for each element of construction or system. Product data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where product data must be specially prepared because standard printed data is not suitable for use, submit as shop drawings.

- A. Manufacturers printed recommendation.
- B. Compliance with recognized testing agency standards.

- C. Application of testing agency labels and seals.
- D. Notation of dimensions verified by field measurement.
- E. Notation of coordination requirements.
- F. Mill certificates.

1.7 ENGINEERS ACTION

- A. Except for submittals for record, information of similar purposes where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.
- B. Compliance with specified characteristics is the Contractors responsibility. Submittal will be rejected for non-compliance of required characteristics.
- C. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked to indicate the action taken.
- D. Submittals not returned within 21 days of receipt by the Engineer will be considered approved as submitted by the Contractor.

2. PRODUCTS

(Not Used)

3. EXECUTION

(Not Used)

4. MEASUREMENT & PAYMENT

(Not Used)

SECTION 01700 CONTRACT CLOSEOUT

1. GENERAL

- 1.1 SECTION INCLUDES
 - A. Closeout Procedures
 - B. Final Cleaning
 - C. Adjusting

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner inspection.
- B. Provide submittals to Owner that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean equipment and fixtures to a sanitary condition.
- C. Clean debris from pull boxes, manholes, and drainage systems.
- D. Clean site; sweep paved areas, remove debris from site areas.
- E. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.4 ADJUSTING

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other Modifications to the Contract
 - 5. Reviewed shop drawings, product data, and samples
- B. Store Record Documents separate from documents used for construction.

- C. Record information concurrent with construction progress.
- D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and Modifications.
- E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract Drawings.
- F. Submit documents to Owner with claim for final Application for Payment.

SECTION 021000 SITE PREPARATION

1. GENERAL

1.1 DESCRIPTION

- A. Work Included: Demolition, clearing and grubbing required for this work includes, but is not necessarily limited to:
 - 1. Felling of trees including removal of stumps, roots and other debris protruding through ground surface.
 - 2. Removing shrubs, grass, weeds and other vegetation.
 - 3. Removing improvements or obstructions that interfere with new construction.
 - 4. Constructing temporary barriers around trees designated to remain.
 - 5. Disconnecting and removing existing utility lines on the site except those designated to remain.
 - 6. Removal of all debris.
- B. Related Work Described Elsewhere:
 - 1. Earthwork: Section 02200.
- C. Definitions: The term "Demolition, Clearing and Grubbing", as used herein, includes the removal of all existing objects (except for those designated to remain) down to the existing ground level (below grade if required to execute properly the new work), plus such other work as is described in this Section of the Specifications.
- 1.2 JOB CONDITIONS
- A. Dust Control:
 - 1. Use necessary means to prevent spread of dust during performance of work.
 - 2. Moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on site.
- B. Disposal of Waste:
 - 1. On site burning will not be permitted.
 - 2. Remove waste materials and unsuitable or excess topsoil from site and legally dispose of it.

- C. Protection:
 - 1. Protect existing objects designated to remain.
 - 2. In event of damage, repair or replace at no additional cost to Owner.

2. PRODUCTS

NONE

3. EXECUTION

3.1 PREPARATION

- A. Site Inspection:
 - 1. Prior to start of work, inspect entire site and all objects designated to be removed or preserved.
 - 2. Locate existing utility lines and determine requirements for disconnecting and capping.
 - 3. Locate existing active utility lines traversing site and determine requirements for protection.
- B. Clarification:
 - 1. The drawings do not purport to show all objects existing on site.
 - 2. Verify with architect all objects to be removed or preserved before commencing work.

3.2 CLEARING AND GRUBBING

- A. Felling of Trees:
 - 1. Protect roots and branches of trees designated to remain.
 - 2. Remove only trees and shrubs within construction area unless otherwise indicated or directed.
 - 3. Completely remove stumps, roots and other debris protruding through ground surface.
 - 4. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

B. Grubbing:

- 1. Remove all surface rocks, stumps, roots and other vegetation within limits of construction.
- 2. Do not leave any roots greater than 3 inches in diameter in the ground.

3.3 STRIPPING TOPSOIL

- A. Strip to whatever depths encountered in such a manner to prevent intermingling with underlying subsoil or other objectionable material.
- B. Remove heavy growths of grass from areas before stripping.
- C. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance from trees to prevent damage to main root system.
- D. Stock pile topsoil where directed.
- E. Construct storage piles to freely drain surface water.
- F. Cover storage piles if required to prevent windblown dust.

SITE CLEARING AND STRIPPING

1. DESCRIPTION

This specification shall govern all work necessary for clearing, grubbing and stripping of objectionable matter as required to complete the project, and shall include removing and disposing of trees, stumps, brush, roots, vegetation, rubbish and other objectionable matter from the project site.

2. CONSTRUCTION METHODS

The site shall be cleared of all trees, stumps, brush, roots, vegetation, rubbish and other objectionable matter as indicated on drawings and/or as directed by the Engineer. Tree stumps and roots shall be grubbed to a minimum depth of 2 feet below natural ground. Areas that underlie compacted backfill shall be stripped of all vegetation, humus and other objectionable matter encountered within the top six (6) inches of the soil. All material removed from the site under this operation shall become the Contractor's responsibility. The material shall be disposed of either at a disposal site indicated on the drawings or at a site obtained by the Contractor.

3. MEASUREMENT AND PAYMENT

Payment shall be full compensation for all labor, equipment, tools and incidentals necessary for the work prescribed in this specification and payment will be part of the project lump sum bid.

SECTION 021040 SITE GRADING

1. DESCRIPTION

This specification shall govern all work necessary for backfill and grading of the site to complete the project.

2. CONSTRUCTION METHODS

Prior to site grading, the site shall be cleared of vegetation and debris. Unless specified otherwise on drawings, the existing surface shall be loosened by scarifying or plowing to a depth of not less than 6 inches. The loosened material shall be re-compacted with fill.

Fill shall be uniform as to material, density, and moisture content. Fill shall be free of large clods, large rocks, organic matter, and other objectionable material. No fill that is placed by dumping in a pile or windrow shall be incorporated into a layer in that position; all such piles and windrows shall be moved by blading or similar method. All fill shall be placed in layers approximately parallel to the finish grade and in layers not in excess of 6 inches of uncompacted depth, unless indicated otherwise on drawings.

The fill shall be compacted to a density which approximates that of natural ground unless indicated otherwise on drawings.

The Engineer may order proof rolling to test the uniformity of compaction. All irregularities, depressions, and soft spots which develop shall be corrected by the Contractor.

Excess material from excavation, which is not incorporated into the site as fill, shall be become property of the Contractor and disposed of away from the job site, unless indicated otherwise on the drawings.

SECTION 021080 REMOVING OLD STRUCTURES

1. DESCRIPTION

This specification shall provide for the removal and disposal of old structures or portions of old structures, as noted on the plans, and shall include all excavation and backfilling necessary to complete the removal. The work shall be done in accordance with the provisions of these specifications.

2. METHOD OF REMOVAL

<u>Culverts or Sewers.</u> Pipe shall be removed by careful excavation of all dirt on top and the sides in such manner that the pipe will not be damaged. Removal of sewer appurtenances shall be included for removal with the pipe. Those pipes which are deemed unsatisfactory for reuse by the Engineer may be removed in any manner the Contractor may select.

<u>Concrete Structures.</u> Unwanted concrete structures or concrete portions of structures shall be removed to the lines and dimensions shown on the plans, and these materials shall be disposed of as shown on the plans or as directed by the Engineer. Any portion of the existing structure outside of the limits designated for removal which is damaged by the Contractor's operations shall be restored to its original condition at the Contractor's entire expense. Explosives shall not be used in the removal of portions of the existing structure unless approved by the Engineer, in writing.

Portions of the old structure shall be removed to the lines and dimensions shown on the plans, and these materials shall be disposed of as shown on the plans or as directed by the Engineer. Any portion of the existing structure, outside of the limits designated for removal, damaged during the operations of the Contractor, shall be restored to its original condition at the Contractor's entire expense. Explosives shall not be used in the removal of portions of the existing structure unless approved by the Engineer, in writing.

Concrete portions of structures below the permanent ground line, which will not interfere in any manner with the proposed construction, may be left in place, but removal shall be carried at least five (5) feet below the permanent ground line and neatly squared off. Reinforcement shall be cut off close to the concrete. Backfill in one-foot lifts and compact to a minimum of 95% Standard Proctor density.

<u>Steel Structures.</u> Steel structures or steel portions of structures shall be dismantled in sections as determined by the Engineer. The sections shall be stored if the members are to be salvaged and reused. Rivets and bolts connecting steel railing members, steel beams of beam spans and steel stringers of truss spans, shall be removed by butting the heads with a "cold cut" and punching or drilling from the hole, or by such other method that will not injure the members for re-use and will meet the approval of the Engineer. The removal of rivets and bolts from connections of truss members, bracing members, and other similar members in the structure will not be required unless specifically called for on the plans or special provisions, and the Contractor shall have the option of dismantling these members by flame-cutting the members immediately adjacent to the connections. Flame-cutting will not be permitted, however, when the plans or special provisions call for the structure unit to be salvaged in such manner as to permit re-erection. In such case, all members shall be carefully match marked with paint in accordance with diagrams furnished by the Engineer prior to dismantling, and all rivets and bolts shall be removed from the connections in the manner specified in the first portion of this paragraph.

<u>Timber Structures.</u> Timber structures or timber portions of structures to be reused shall be removed in such manner as to damage the timber for further use as little as possible. All bolts and nails shall be

removed from such lumber as deemed salvable by the Engineer.

Unless otherwise specified on the plans, timber piles shall be either pulled or cut off at the point not less than two (2) feet below ground line, with the choice between these two methods resting with the Contractor, unless otherwise specified.

<u>Brick or Stone Structures.</u> Unwanted brick or stone structures or stone portions of structures shall be removed. Portions of such structures below the permanent ground line, which will not in any manner interfere with the proposed construction, may be left in place, but removal shall be carried at least five (5) feet below the permanent ground line and neatly squared off. Backfill in one-foot lifts and compact to a minimum of 95% Standard Proctor density.

<u>Salvage.</u> All material such as pipe, timbers, railings, etc., which the Engineer deems as salvable for reuse, and all salvaged structural steel, shall be delivered to a designated storage area.

Materials, other than structural steel, which are not deemed salvable by the Engineer, shall become the property of the Contractor and shall be removed to suitable disposal sites off of the right-of-way arranged for by the Contractor, or otherwise disposed of in a manner satisfactory to the Engineer.

Where temporary structures are necessary for a detour adjacent to the present structure, the Contractor will be permitted to use the material in the old structure for the detour structure, but he shall dismantle and stack or dispose of the material as required above as soon as the new structure is opened for traffic.

<u>Backfill.</u> All excavations made in connection with this specification and all openings below the natural ground line caused by the removal of old structures or portions thereof shall be backfilled to the level of the original ground line, unless otherwise provided on the plans.

That portion of the backfill which will support any portion of the roadbed or embankment shall be placed in layers of the same depth as those required for placing embankment. Material in each layer shall be wetted uniformly, if required, and shall be compacted to a minimum of 95% Standard Proctor density. In places inaccessible to blading and rolling equipment, mechanical or hand tamps or rammers shall be used to obtain the required compaction.

That portion of the backfill which will not support any portion of the roadbed or embankment shall be placed as directed by the Engineer in such manner and to such state of compaction as will preclude objectionable amount of settlement.

3. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 022000 EARTHWORK

1. GENERAL

1.1 DESCRIPTION

- A. Work included but not limited to:
 - 1. Parking Areas
 - 2. Driveways
 - 3. Concrete Walks
 - 4. Concrete Structures

1.2 QUALITY ASSURANCE

- A. Codes and References:
 - 1. Comply with pertinent codes and regulations.
 - 2. Comply with referenced portions of Texas Highway Department "Standard Specifications for Construction of Highways, Streets and Bridges" (Latest Edition). Payment items shall not apply.

1.3 PRODUCT HANDLING

- A. Protection:
 - 1. Protect subgrade materials before, during, and after installation.
 - 2. Protect work and materials of other trades.
- B. Replacement: In event of damage, make repairs and replacements as necessary at no additional cost to Owner.

2. PRODUCTS

2.1 SELECTION OF MATERIALS

A. Where shown on plans, selected materials shall be utilized in the formation of embankment or to improve the roadbed, in which case the work shall be performed in such manner and sequence that suitable materials may be selected, removed separately and deposited in the construction area within limits and at elevations required.

3. EXECUTION

- 3.1 CONSTRUCTION METHODS
 - A. Stripping and Excavation:

- 1. Strip the top 6" in all areas to underly compacted fill, curbs, base or pavement, by removing all humus, vegetation and other unsuitable materials. Remove existing trees, shrubs, fences, curb, gutter, sidewalk, drives, paving and structures within the graded area which interfere with new construction or finished grading.
- 2. All suitable excavated materials shall be utilized, insofar as practicable, in constructing the required roadway sections or in uniformly widening embankments, flattening slopes, etc., as directed by the Engineer. Unsuitable roadway excavation and roadway excavation in excess of that needed for construction shall be known as "Waste" and shall become the property of the Contractor to be disposed of by him outside the limits of the right-of-way at a location suitable to the Engineer. "Unsuitable" material encountered below subgrade elevation in roadway cuts, when declared "Waste" by the Engineer, shall be replaced, as directed by the Engineer, with material from the roadway excavation or with other suitable material.
- B. Subgrade preparation:
 - 1. That area shown on the plans for Parking Area, driveway, or concrete structure construction shall be scarified to a depth not less than 6" and compacted to 95% standard proctor density. Irregularities exceeding 1/2" in 16' shall be corrected. Soft areas found at any time shall be dug out, the material replaced with acceptable and compacted (esp. at utility trenches). The moisture density shall be maintained until the subgrade is covered by the specified material.
 - 2. That area shown on the plans for channel excavation and excavated slopes shall be finished in conformance with the lines and grades shown on the plans and no point on completed slopes shall vary from the designated slopes by more than 0.5 foot measured at right angles to the slope, unless otherwise specified. The tops of excavated slopes and the end of excavation shall be rounded as shown on the plans.
- C. Curb Backfill and Topsoil (Sidewalks, Parkways, Islands, etc.):
 - 1. Compact earth behind curbs without delay after curb completion. The top 3" (where disturbed by construction or where unsatisfactory material is exposed by excavation) of finished earth grade shall be of loamy top soil of approved type and source where "Top Soil" is called for on the plans. No excessive clods are allowed.
- D. Matching Grades at Right -of-Way Line:
 - 1. Finished grade at the property line shall be as shown on the plans. A reasonable amount of filling on private property may be required by the Engineer where the sidewalk grade is above the property elevation. Use suitable material from the excavation.
- E. Drainage:

1. During construction the roadbed and ditches shall be maintained in such condition as to insure proper drainage at all times and ditches and channels shall be constructed and maintained as to avoid damage to the roadway section. All slopes which, in the judgment of the Engineer, require variation shall be accurately shaped and care shall be taken that no material is loosened below the required slopes. All breakage and slides shall be removed and disposed of as directed.

SECTION 022020 EXCAVATION AND BACKFILL FOR UTILITIES AND SEWERS

1. DESCRIPTION

This specification shall govern all excavation for storm or sanitary sewers, sewers structures appurtenances and connections, utility pipe or conduits, and for backfilling to the level of the original ground, all in conformity with the locations, lines, and grades shown on the plans or as established by the Engineer. This specification also governs for the necessary pumping or bailing and drainage, and all sheathing and bracing of trench walls, the furnishing and placing of cement stabilized backfill, and hauling and disposition of surplus materials, and the bridging of trenches and other provisions for traffic or access as provided herein.

2. CONSTRUCTION

2.1 GENERAL

Unless otherwise specified on the plans or permitted by the Engineer, all sewers, pipe, and conduit shall be constructed in open cut trenches with vertical sides. Trenches shall be sheathed and braced as necessary throughout the construction period. Sheathing and bracing shall be the responsibility of the Contractor (Section 022022).

Trenches shall have a maximum width of one foot beyond the horizontal projection of the outside surfaces of the pipe and parallel thereto on each side unless otherwise specified.

The Contractor shall not have more the 200 feet of open trench left behind the trenching operation and no more then 500 feet of ditch behind the ditching machine that is not compacted as required by the plans and specification. No trench or excavation shall remain open after working hours.

For all utility conduit and sewer pipe to be constructed in fill above natural ground, the embankment shall first be constructed to an elevation not less than one foot above the top of pipe or conduit after which excavation for the pipe or conduit shall be made.

If quicksand, muck, or similar unstable material, is encountered at the bottom of the excavation, the following procedure shall be used unless other methods are called for on the plans. If the unstable condition is a result of ground water, it shall be controlled by the Contractor, prior to additional excavation. After stable conditions have been achieved, unstable soil shall be removed or stabilized to a depth of 2 feet below the bottom of pipe for pipes 2 feet or more in height; and to a depth equal to the height of pipe, 6 inch minimum, for pipe less then 2 feet in height. Such excavation shall be carried at least 1 foot beyond the horizontal limits of the structure on all sides. All unstable soil so removed shall be replaced with suitable stable material, placed in uniform layers of suitable depth as directed by the Engineer, and each layer shall be wetted, if necessary, and compacted by mechanical tamping as required to provide a stable foundation for the structure. Soil which is considered to be of sufficient stability to sustain properly the adjacent sections of the roadway embankment will be considered a suitable foundation material for the culvert or sewer. For unstable trench conditions requiring outside forms, seals, sheathing, and bracing, or where ground water is encountered and additional excavation and backfill required shall be done at the contractor's expense.

2.2 SHAPING OF TRENCH BOTTOM

The trench bottom shall be undercut a minimum depth sufficient to accommodate the class of bedding indicated in the plans and specification.

2.3 DEWATERING TRENCH

Pipe or conduit shall not be constructed or laid in a trench in the presence of water. All water shall be removed from the trench sufficiently prior to the pipe or conduit planing operation insure a relatively dry (no standing water), firm bed. The trench shall be maintained in such dewatered condition until the trench has been backfilled to a height at lease one foot above the top of pipe. Removal of water may be accomplished by bailing, pumping, or by a well-points installation as conditions warrant. Removal of well points shall be at rate of 1/3 per 24 hours (every third well-point).

2.4 EXCAVATION IN STREETS

Excavation in streets, together with the maintenance of traffic where specified, and the restoration of the pavement riding surface shall be in accordance with plan detail or as required by other applicable specification.

2.5 REMOVING OLD STRUCTURES

When old masonry structures or foundations are encountered in the excavation, such obstructions shall be removed for the full width of the trench and to a depth of 1-foot below the bottom of the trench. When old inlets or manholes are encountered and no plan provision is made for adjustment or connection to the new sewer, such manholes and inlets shall be removed completely to a depth 1-foot below the bottom of the trench. In each instance, the bottom to the trench shall be restored to grade by backfilling and compacting by the methods provided hereinafter for backfill. Where the trench cuts through storm or sanitary sewers which are known to be abandoned, these sewers shall be cut flush with sides of the trench and blocked with a concrete plug in a manner satisfactory to the Engineer.

2.6 PROTECTION OF UTILITIES

The Contractor shall conduct his work such that a reasonable minimum of disturbance to existing utilities will result. Particular care shall be exercised to avoid the cutting or breakage of water and gas line. Such lines, if broken, shall be restored promptly by the Contractor. When active sanitary sewer lines are cut in the trenching operations, temporary flumes shall be provided across the trench, while open, and the lines shall be restored when the backfilling has progressed to the original bedding lines of the sewer so cut.

The Contractor shall inform utility Owners sufficiently in advance of the Contractor's operations to enable such utility Owners to reroute, provide temporary detours, or to make other adjustments to utility lines in order that the Contractor may proceed with his work with a minimum of delay and concerned in effecting any utility adjustments necessary and shall not hold the Owner liable for any expense due to delay or additional work because of conflicts.

2.7 EXCESS EXCAVATED MATERIAL

All materials from excavation not required for backfilling the trench shall be removed, by the Contractor,

from the job site promptly following the completion of work involved.

2.8 BACKFILL

A. <u>Backfill Procedure Around Pipe</u>

All trenches and excavation shall be backfilled as soon as is practical after the pipes or conduits are properly laid. In addition to the specified pipe bedding material, the backfill around the pipe as applicable, shall be backfilled to the base with cement stabilized sand containing a minimum of 2 sacks of standard Type I Portland cement per cubic yard of sand. The backfill shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench, in layers not to exceed six (6) inches (loose measurement), wetted if required to obtain proper compaction, and thoroughly compacted by mechanical tampers to a density comparable to the adjacent undisturbed soil, so that a thoroughly compacted material shall be in place between the external wall of the pipe and the undisturbed sides of the trench.

B. Backfill Over One Foot Above Pipe

The backfill for that portion of trench over (1) foot above the pipe or conduit shall be selected excavated material free of hard lumps, rock fragments, or other debris, placed in layers not more than 6 inches in depth (loose measurement), wetted if required and thoroughly compacted by use of mechanical tampers to the natural bank density and not less than 95% Std. Proctor. Flooding of backfill is not allowed. Jetting of backfill will be allowed in sandy soils and in soils otherwise approved by the Engineer. Regardless of backfill method, no lift shall exceed one foot and density shall not be less than 95% Std. Proctor. The last four feet of backfill shall be placed in layers of not more than 6 inches and compacted by use of mechanical tampers to the natural back density and not less than 95% Std. Proctor.

A period of not less than twenty-four (24) hours shall lapse between the time of jetting and the placing of the top four (4) feet of backfill.

3. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay but shall be subsidiary to the project.

SECTION 022021 CONTROL OF GROUND WATER

1. GENERAL

1.1 SECTION INCLUDES

A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations, and foundation beds in a stable condition, and controlling ground water conditions for tunnel excavations.

B. Protection of excavations and trenches from surface runoff.

C. Disposing of removed ground water by approved methods.

1.2 REFERENCES

A. ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.

B. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

C. Federal Register 40 CFR (Vol. 55, No. 222) Part 122, EPA Administered Permit Programs (NPDES), Para.122.26(b)(14) Storm Water Discharge.

1.3 DEFINITIONS

A. Ground water control includes both dewatering and depressurization of water-bearing soil layers.

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

2) Depressurization includes reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom or instability of tunnel excavations.

B. Excavation drainage includes keeping excavations free of surface and seepage water.

C. Surface drainage includes the use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the Work from any source of surface water.

D. Equipment and instrumentation for monitoring and control of the ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.

1.4 PERFORMANCE REQUIREMENTS

A. Conduct subsurface investigations as needed to identify ground water conditions and to provide parameters for design, installation, and operation of ground water control systems.

B. Design a ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and City Standard Specification Section 022022 - Trench Safety for Excavations, to produce the following results:

Effectively reduce the hydrostatic pressure affecting:

 a) Excavations (including utility trenches);
 b) Tunnel excavation, face stability or seepage into tunnels.

Develop a substantially dry and stable subgrade for subsequent construction operations.

 3) Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.

Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation

4) Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.

5) Maintain stability of sides and bottom of excavations.

C. Provide ground water control systems which may include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.

D. Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.

E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water away from excavations.

F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures, and any settlement or resultant damage caused by the ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.

H. Provide an adequate number of piezometers installed at the proper locations and depths as

required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.

I. Provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.

J. Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use, if applicable.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of agencies having jurisdiction.

B. Comply with Texas Commission on Environmental Quality (TCEQ) regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.

C. Prior to beginning construction activities, file Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the Texas Pollutant Elimination System (TPDES) General Permit No. TXR150000, administered by the Texas Commission on Environmental Quality (TCEQ). The general permit falls under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code.

D. Prepare submittal form and submit to TCEQ along with application fee.

E. Upon completion of construction, file Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under the TPDES General Permit with the TCEQ.

F. Obtain all necessary permits from agencies with control over the use of ground water and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.

G. Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.

H. Conduct sampling and testing of ground water and receiving waters as outlined in Article 3 below.

2. PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering.

B. Eductors, well points, or deep wells, where used, shall be furnished, installed and operated by an

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experienced contractor regularly engaged in ground water control system design, installation, and operation.

C. All equipment must be in good repair and operating order.

D. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

3. EXECUTION

3.1 GROUND WATER CONTROL

A. Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine the drawdown characteristics of the water bearing layers.

B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.

C. Install, operate, and maintain ground water control systems in accordance with the ground water control system design. Notify the City's Construction Inspector in writing of any changes made to accommodate field conditions and changes to the Work. Revise the ground water control system design to reflect field changes.

D. Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.

E. Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.

F. Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to works. Allowable piezometric elevations shall be defined in the ground water control system design.

G. Remove ground water control installations.

1) Remove pumping system components and piping when ground water control is no longer required.

2) Remove piezometers and monitoring wells when directed by the City Engineer.

3) Grout abandoned well and piezometer holes. Fill piping that is not removed with cementbentonite grout or cement-sand grout.

H. During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hour after placement.

I. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.

J. Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such as for units designed to withstand hydrostatic uplift pressure. Provide a means for draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.

K. Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.

L. In unpaved areas, compact backfill to not less than 95 percent of Standard Proctor maximum dry density in accordance with ASTM D 698. In paved areas (or areas to receive paving), compact backfill to not less than 98 percent of Standard Proctor maximum dry density in accordance with ASTM D 698.

3.2 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For above ground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.

B. Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are pre-drained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.

C. Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation (including trenching).

D. Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is pre-drained by an existing system such that the criteria of the ground water control system design are satisfied.

E. Replace installations that produce noticeable amounts of sediments after development.

F. Provide additional ground water control installations, or change the methods, in the event that the installations according to the ground water control system design do not provide satisfactory results based on the performance criteria defined by the ground water control system design and by these specifications.

3.3 EXCAVATION DRAINAGE

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

3.4 MAINTENANCE AND OBSERVATION

A. Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area or seepage into tunnel is occurring. Keep system in good condition.

B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.

C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.

D. Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the City Engineer.

3.5 MONITORING AND RECORDING

A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved, and twice weekly thereafter.

B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when City Engineer determines that more frequent monitoring and recording are required. Comply with Construction Inspector's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

3.6 SAMPLING, TESTING AND DISPOSAL OF GROUND WATER

A. It is the intent that the Contractor discharge groundwater primarily into the existing storm water system in accordance with City Ordinance, Article XVI, Section 55-203, only if the groundwater is uncontaminated and the quality of the ground water is equal to or better than the quality of the receiving stream.

B. The Contractor shall prevent ground water from trench or excavation dewatering operations from discharging directly into the storm water system prior to testing and authorization. Ground water from dewatering operations shall be sampled and tested, and disposed of by approved methods.

C. Laboratory analysis of groundwater and receiving water quality is to be performed by the

Contractor at the Contractor's expense, prior to commencing discharge, and groundwater analysis shall be performed by the Contractor at a minimum of once per week. Contractor shall coordinate with the City Storm Water Department on all laboratory analysis. Laboratory analysis of groundwater shall also be performed at each new area of construction prior to discharge from that location.

D. Sample containers, holding times, preservation methods, and analytical methods, shall either follow the requirements in 40 CFR Part 136 (as amended), or the latest edition of "Standard Methods for the Examination of Water and Wastewater." Any laboratory providing analysis must be accredited or certified by the Texas Commission on Environmental Quality according to Title 30 Texas Administrative Code (30 TAC) Chapters 25 for the matrices, methods, and parameters of analysis, if available, or be exempt according to 30 TAC §25.6.

E. Analysis of the ground water discharge shall show it to be equal to or better than the quality of the first natural body of receiving water. This requires testing of both the receiving water and a sample of the ground water. All parts of this procedure shall be complete prior to any discharge of ground water to the storm water system.

F. Steps to Determine Legitimate Discharge:

1)Identify the First Receiving Water.

a) When the first body of water is a fresh water system (Nueces River or Oso Creek), the analysis typically fails because the local ground water will likely be too high in Total Dissolved Solids (TDS). In the case of a perched aquifer, the ground water may turn out fairly fresh, but local experience shows this to be unlikely.

b) If the receiving water is a marine environment, proceed with Step 2 below to compare the ground water quality to receiving water quality.

2) Compare Ground Water Discharge Quality to Receiving Water Quality. The following table, Ground Water Discharge Limits, indicates that the parameters to compare to the receiving water are Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). If the ground water results are equal to or better than the receiving water, then the discharge may be authorized as long as the discharge does not exceed the other parameters which would indicate hydrocarbon contamination. Note that the receiving water only needs to be tested initially as a baseline and the ground water shall be tested weekly to ensure compliance.

GROUND WATER DISCHARGE LIMITS

Parameter	Ground Water Monitoring Frequency	Receiving Water Monitoring Frequency	Maximum Limitation
Total Dissolved Solids (TDS)	Initial + Weekly	Once Prior to Discharge	< Receiving Water
Total Suspended Solids (TSS)	Initial + Weekly	Once Prior to Discharge	< Receiving Water
Total Petroleum Hydrocarbons	Initial + Weekly		15 mg/L
Total Lead	Initial + Weekly		0.1 mg/L
Benzene	Initial + Weekly		0.005 mg/L
Total BTEX	Initial + Weekly		0.1 mg/L
Polynuclear Aromatic Hydrocarbons	Initial + Monthly		0.01 mg/L

3) Analyze Ground Water for Hydrocarbon Contamination.

All other parameters listed on the Ground Water Discharge Limits table must be analyzed prior to ground water discharge to the storm water system. If no limits are exceeded, ground water discharge to the storm water system may be authorized following notification to the MS4 operator (City of Corpus Christi) and all Pollution Prevention Measures for the project are in place. Analytical results shall be on-site or readily available for review by local, state or federal inspectors. Note that this step is frequently done simultaneously with Step 2 above to shorten analytical processing time.

4) Pollution Prevention Measures.

A storm water pollution prevention plan or pollution control plan shall be developed and implemented prior to any ground water discharges to the storm water system. The plan's objectives are to limit erosion and scour of the storm water system, and minimize Total Suspended Solids (TSS) and other forms of contamination, and prevent any damage to the storm water system. Note that ground water discharges must cease immediately upon the first recognition of contamination, either by sensory or analytical methods. If the discharge of groundwater results in any damages to the storm water system, the responsible party shall remediate any damage to the storm water system and the environment to the satisfaction of the Storm Water Department and/or any State or Federal Regulatory Agency.

5) MS4 Operator Notification.

The MS4 operator shall be notified prior to ground water discharge to the storm water system. Contractor shall contact the designated City MS4 representative to request authorization to discharge ground water to the storm water system. Notification shall include:

Project Name:Responsible Party:Discharge Location:Receiving Water:Estimated Time of Discharge:Linear Project: Yes / NoNo

Pollution Prevention Measures Implemented:

Statement indicating all sampling and testing has been conducted and meets the requirements of a legitimate discharge.

G. Discharges to Wastewater System.

In the event that the groundwater does not equal or exceed the receiving water quality, an alternative disposal option would include pumping to the nearest sanitary sewer system. Discharge to the sanitary sewer system requires a permit from the Wastewater Department. If discharging to temporary holding tanks and trucking to a sanitary sewer or wastewater treatment plant, the costs for these operations shall be negotiated.

Contractor shall contact the Pretreatment Group for City Utility Operations to obtain a Wastewater Discharge Permit Application for authorization to discharge to the wastewater system. Authorization approval will include review of laboratory analysis of the ground water and estimated flow data. Note that groundwater discharges must cease immediately upon the first recognition of contamination, either by sensory or analytical methods. If the discharge of groundwater results in any damages to the wastewater collection system or wastewater overflows, the responsible party shall remediate any damage to the wastewater collection system and the environment to the satisfaction of the Wastewater Department and/or any State or Federal Regulatory Agency.

H. Other groundwater disposal alternatives or solutions may be approved by the Engineer on a case by case basis.

3.7 SURFACE WATER CONTROL

A. Intercept surface water and divert it away from excavations through the use of dikes, ditches, curb walls, pipes, sumps or other approved means.

B. Divert surface water into sumps and pump into drainage channels or storm drains, when approved by the City Engineer. Provide settling basins when required by the City Engineer.

C. Storm water that enters the excavation can be pumped out as long as care is taken to minimize solids and mud entering the pump suction and flow is pumped to a location that allows for sheet flow prior to entering a storm water drainage ditch or storm water inlet. An alternative to sheet flow is to pump storm water to an area where ponding occurs naturally without leaving the designated work area or by manmade berm(s) prior to entering the storm water system. Sheet flow and ponding is required to allow solids screening and/or settling prior to entering the storm water system. Storm water or groundwater shall not be discharged to private property.

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, control of ground water will not be measured and paid for separately, but shall be considered subsidiary to other bid items.

SECTION 022022 TRENCH SAFETY FOR EXCAVATIONS

1. DESCRIPTION

This specification shall govern all work for providing for worker safety in excavations and trenching operations required to complete the project.

2. REQUIREMENTS

Worker Safety in excavations and trenches shall be provided by the Contractor in accordance with Occupational Safety and Health Administration (OSHA) Standards, 29 CPR Park 1926 Subpart P - Excavations.

It is the sole responsibility of the Contractor, and not the Owner or Engineer, to determine and monitor the specific applicability of a safety system to the field conditions to be encountered on the job site during the project.

The Contractor shall indemnify and hold harmless the Owner and Engineer from all damages and cost that may result from failure of methods or equipment used by the Contractor to provide for worker safety.

Trenches as used herein, shall apply to any excavation into which structures, utilities, or sewers are placed regardless of depth.

Trench Safety Plan as used herein shall apply to all methods and materials used to provide for worker safety in excavation and trenching operations required during the project.

3. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 022040 STREET EXCAVATION

1. DESCRIPTION

This specification shall govern all work for Street Excavation required to complete the project.

2. CONSTRUCTION METHODS

(A) <u>Stripping and Excavation</u>

Strip the top 11 inches in all areas to underlay compacted fill, curbs, base or pavement, by removing all humus, vegetation and other unsuitable materials. Unless otherwise noted, remove existing trees, shrubs, fences, curb, gutter, sidewalk, drives, paving, pipe and structures within the graded area which interfere with new construction of finished grading.

All suitable excavated materials shall be utilized, insofar as practicable, in constructing the required roadway sections or in uniformly widening embankments, flattening slopes, etc., as directed by the Engineer, provided that the material has a plasticity index (P.I.) of 35 or less. Unwanted roadway excavation and roadway excavation in excess of that needed for construction shall become the property of the Contractor to be disposed of by him outside the limits of the right-of-way at a location suitable to the Engineer. "Unsuitable" material encountered below subgrade elevation in roadway cuts, when declared unwanted by the Engineer, shall be replaced as directed by the Engineer with material from the roadway excavation or with other suitable material.

Maintain moisture and density until covered by the subbase or base course. Remove soft or wet areas found at any time, replace with suitable material, and recompact (especially utility trenches).

(B) <u>Subgrade Preparation</u>

That area shown on the plans for street construction shall be cut to grade, scarified to a depth not less than 6 inches or as otherwise indicated on the drawings and compacted to 95% Standard Proctor density. Irregularities exceeding ½ inch in 16 feet shall be corrected. Soft areas found at anytime shall be removed, replaced with acceptable material and compacted (especially at utility trenches). The correct moisture density relationship shall be maintained.

(C) Curb Backfill and Topsoil (Sidewalks, Parkways, Islands, etc.)

Fill and compact areas behind curbs and adjacent to sidewalks and driveways without delay after completion of concrete work. The top 6 inches (where disturbed by construction or where unsatisfactory material is exposed by excavation) of finish earth grade shall be clean excavated material or topsoil capable of supporting a good growth of grass when fertilized and seeded or sodded. It shall be free of concrete, asphalt, shell, caliche, debris and any other material that detracts from its appearance or hampers the growth of grass.

(D) Matching Grades at Right-of-Way Line

Finish grade at the property line shall be as shown on the plans. The Engineer may require a reasonable amount of filling on private property where the sidewalk grade is above the property elevation. Use suitable material from the excavation. Unless otherwise directed, cuts at right-of -way lines shall be made at a slope of three horizontal to one vertical (3:1).

(E) <u>Drainage</u>

During construction, the roadbed and ditches shall be maintained in such condition as to insure proper drainage at all times, and ditches and channels shall be so constructed and maintained as to avoid damage to the roadway section.

All slopes which, in the judgment of the Engineer, require variation, shall be accurately shaped, and care shall be taken that no material is loosened below the required slopes. All breakage and slides shall be removed and disposed of as directed.

3. SELECTION OF MATERIALS

Where shown on the plans, selected materials shall be utilized to improve the roadbed, in which case the work shall be performed in such manner and sequence that suitable materials may be selected, removed separately, and deposited in the roadway within limits and at elevations required. Material used for roadway embankment shall have a plasticity index (P.I.) of 35 or less.

4. GEOGRID

Where shown on the plans, geogrid shall be placed on top of the compacted subgrade layer to strengthen the roadbed. Geogrid shall be "TENSAR BX-1200", or approved equivalent. Overlap edges of geogrid in accordance with the manufacturer's recommendations, but not less than 12 inches.

5. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 022060 CHANNEL EXCAVATION

1. DESCRIPTION

This specification shall govern all work for Channel Excavation required to complete the project.

2. CONSTRUCTION METHODS

Trees, stumps, brush and other vegetation shall be removed and hauled away. Excavated slopes shall be finished in conformance with the lines and grades established by the Engineer. When completed, the average plane of slopes shall conform to the slopes indicated on the drawings, and no point on completed slopes shall vary from the designated slopes by more than 0.5 foot measured at right angles to the slope. In no case shall any portion of the slope encroach on the roadbed. The tops of excavated slopes and the end of excavation shall be rounded. The bottom and sides of the ditch or channel shall be undercut a minimum depth sufficient to accommodate topsoil for seeding, sodding, or slope protection, as indicated on the drawings.

All suitable materials removed from the excavation shall be used, insofar as practicable, in the formation of embankments in accordance with City Standard Specification Section 022080 "Embankment", or shall be otherwise utilized or satisfactorily disposed of as indicated on drawings, or as directed, and the completed work shall conform to the established alignment, grades and cross sections. During construction, the channel shall be kept drained, insofar as practicable, and the work shall be prosecuted in a neat workmanlike manner.

Unsuitable channel excavation in excess of that needed for construction shall become the property of the Contractor and removed from the site and properly disposed of.

3. SELECTION OF MATERIALS

Where shown on the drawings, selected materials shall be utilized in the formation of embankment or to improve the roadbed, provided that the material meets the requirements specified in City Standard Specification Sections 022040 "Street Excavation" and 022100 "Select Material", in which case the work shall be performed in such manner and sequence that suitable materials may be selected, removed separately and deposited in the roadway within the limits and at elevations required. Concrete for lining channels, where specified on the drawings, shall be Class "A" in accordance with City Standard Specification Section 030020 "Portland Cement Concrete".

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, channel excavation shall be measured in its original position and the volume computed in cubic yards by the method of average end areas, or by linear foot of channel or drainage ditch, as specified. Channel excavation shall include, but not be limited to, clearing and removal of vegetation, excavation, de-watering, embankment, compaction, hauling, and disposal. Channel excavation shall not include undercutting to accommodate topsoil, sod, or slope protection. Payment shall be at the bid price for the unit of measurement specified and shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work.
SECTION 022080 EMBANKMENT

1. DESCRIPTION

This specification shall govern all work for Embankment required to complete the project.

2. CONSTRUCTION METHODS

Prior to placing embankment, the area to be covered shall be stripped of all vegetation and the material so removed shall be disposed of off the job site. Washes, gulleys, wet areas, and yielding areas shall be corrected as directed by the Engineer.

Unless otherwise indicated on the drawings, the surface of the ground which is to receive embankment shall be loosened by scarifying or plowing to a depth of not less than 6 inches. The loosened material shall be recompacted with the new embankment as hereinafter specified. Embankment shall be placed in layers not to exceed ten (10) inches uncompacted (loose) depth for the full width of the embankment, unless otherwise noted.

Where embankment is adjacent to a hillside or old roadbed, the existing slope shall be cut in steps to not less than the vertical depth of an uncompacted layer. The fill material shall be placed from the low side and compacted. Each layer shall overlap the existing embankment by at least the width indicated by the embankment slope.

Trees, stumps, roots, vegetation, debris or other unsuitable materials shall not be placed in embankment.

Each layer of embankment shall be uniform as to material, density and moisture content before beginning compaction. Where layers of unlike materials abut each other, each layer shall be feather-edged for at least 100 feet or the material shall be so mixed as to prevent abrupt changes in the soil. No material placed in the embankment by dumping in a pile or windrow shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods. Clods or lumps of material shall be broken and the embankment material mixed by blading, harrowing, disking or similar methods to the end that a uniform material of uniform density is secured in each layer. Except as otherwise required by the drawings, all embankments shall be constructed in layers approximately parallel to the finished grade and each layer shall be so constructed as to provide a uniform slope of 1/4 inch per foot from the centerline of the embankment to the outside.

Each layer shall be compacted to the required density and moisture by any method, type and size of equipment that will give the required compaction. Prior to and in conjunction with the rolling operation, each layer shall be brought to the moisture content necessary to obtain the required density and shall be kept leveled with suitable equipment to insure uniform compaction over the entire layer.

For each layer of earth embankment and select material, it is the intent of this specification to provide the density as required herein, unless otherwise shown on the drawings. Soils for embankment shall be sprinkled with water as required to provide not less than optimum moisture and compacted to the extent necessary to provide not less than 95% Standard Proctor density

(ASTM D698). Field density determinations will be made in accordance with approved methods. After each layer of earth embankment or select material is complete, tests, as necessary, will be made by the Engineer. If the material fails to meet the density specified, the course shall be reworked as necessary to obtain the specified compaction, and the compaction method shall be altered on subsequent work to obtain specified density. Such procedure shall be determined by, and subject to, the approval of the Engineer.

The Engineer may order proof rolling to test the uniformity of compaction of the embankment layers. All irregularities, depressions, weak or soft spots which develop shall be corrected immediately by the Contractor.

Should the embankment, due to any reason or cause, lose the required stability, density or moisture before the pavement structure is placed, it shall be recompacted and refinished at the sole expense of the Contractor. Excessive loss of moisture in the subgrade shall be prevented by sprinkling, sealing or covering with a subsequent layer of granular material.

3. SELECTION OF MATERIAL

In addition to the requirement in the excavation items of the specifications covering the general selection and utilization of materials to improve the roadbed, embankments shall be constructed in proper sequence to receive the select material layers shown on drawings, with such modifications as may be directed by the Engineer. The layer of embankment immediately preceding the upper layer of select material shall be constructed to the proper section and grade within a tolerance of not more than 0.10 foot from the established section and grade when properly compacted and finished to receive the select material layer. Select material, when specified, shall meet the requirements in City Standard Specification Section 022100 "Select Material".

4. MEASUREMENT AND PAYMENT

Unless otherwise specified on the Bid Form, embankment shall not be measured and paid for separately, but shall be subsidiary to other items of work. END OF SECTION

SECTION 022100 SELECT MATERIAL

1. DESCRIPTION

This specification shall govern the use of select material to be used to treat designated sections of roadways, embankments, trenches, etc. Select material shall be a mixture of sand and clay or other suitable granular material. The material shall be free from vegetation, debris and clay lumps. That portion of the select material passing a 40-mesh sieve shall have a liquid limit of 45 maximum, a plasticity index range from 6 to 15, and a calculated linear shrinkage of 8.5 maximum.

2. CONSTRUCTION METHODS

Select material shall be mixed uniformly and placed in layers not to exceed 6" loose depth. The material shall be brought to approximately optimum moisture content and compacted to 95% Standard Proctor Density. Each layer shall be complete before the succeeding layer is placed.

The finished surface of the select material shall conform to the grade and section shown on the plans.

SECTION 022420 SILT FENCE

1. DESCRIPTION

This specification shall govern all work necessary for providing and installing silt fences required to complete the project.

2. MATERIAL REQUIREMENTS

- A. Geotextile shall meet the requirements for temporary silt fence per AASHTO m288.
- B. Fence Reinforcement Materials:

Silt fence reinforcement shall be one of the following systems.

<u>Type 1: Self-Supported Fence</u> - This system consists of fence posts, spaced no more than 8-1/2 feet apart, and geotextile without net reinforcement. Fence posts shall be a minimum of 42 inches long, embedded at least 1 foot, and constructed of either wood or steel. Soft wood posts shall be at least 3 inches in diameter or nominal 2 x 4 in. and essentially straight. Hardwood posts shall be a minimum of 1.5 x 1.5 in. Fabric attachment may be by staples or locking plastic ties at least every 6 inches, or by sewn vertical pockets. Steel posts shall be T or L shaped with a minimum weight of 1.3 pounds per foot. Attachment shall be by pockets or by plastic ties if the posts have suitable projections.

<u>Type 2: Net-Reinforced Fence</u> - This system consists of fence posts, spaced no more than 8-1/2 feet apart, and geotextile with an attached reinforcing net. Fence posts shall meet the requirements of Self-Supported Fence. Net reinforcement shall be galvanized welded wire mesh of at least 12.5-gauge wire with maximum opening size of 4 inches square. The fabric shall be attached to the top of the net at least every 2 feet, or as otherwise specified.

<u>Type 3: Triangular Filter Dike</u> - This system consists of a rigid wire mesh, at least 6-gauge, formed into an equilateral triangle cross-sectional shape with sides measuring 18 inches, wrapped with geotextile silt fence fabric. The fabric shall be continuously wrapped around the dike, with a skirt extending at least 12 inches from its upslope corner.

C. <u>Packaging Requirements</u>: Prior to installation, the fabric shall be protected from damage due to ultraviolet light and moisture by either wrappers or inside storage.

D. <u>Certification and Identification</u>: Each lot or shipment shall be accompanied by a certification of conformance to this specification. The shipment must be identified by a ticket or labels securely affixed to the fabric rolls. This ticket or label must list the following information:

a. Name of manufacturer or supplier

b. Brand name and style

- c. Manufacturer's lot number or control number
- d. Roll size (length & width)
- e. Chemical composition

SECTION 025205 PAVEMENT REPAIR, CURB, GUTTER, SIDEWALK AND DRIVEWAY REPLACEMENT

1. DESCRIPTION

This specification shall govern the removal and replacing of all types of pavements and surfacing required to complete the project.

2. MATERIALS

Unless otherwise specified on the plans, materials and proportions used along with this specification shall conform to the respective following specifications:

Section 025220 "Flexible Base - Caliche" Section 025223 "Crushed Limestone Flexible Base" Section 025424 "Hot Mix Asphaltic Concrete Pavement" Section 025610 "Concrete Curb and Gutter" Section 025612 "Concrete Sidewalks and Driveways" Section 030020 "Portland Cement Concrete" Section 032000 "Reinforcing Steel" Section 038000 "Concrete Structures"

3. METHOD OF CUTTING

The outline of the trench shall be marked upon the surface of the pavement to be cut, and all cuts into the pavement shall be saw-cut as nearly vertical as it is possible to make them. All unwanted materials removed shall be disposed of by the Contractor and shall not be used as backfill material.

4. BACKFILL OF TRENCH

Excavation and backfilling of trench shall be in accordance with the construction drawings.

5. REPLACING STREET PAVEMENT

All pavements, driveways, sidewalks, and curbs and gutters which are cut shall be replaced in a workmanlike manner, with like or better materials or per pavement repair details on the drawings.

6. REPLACING DRIVEWAY PAVEMENT

On all concrete driveway pavements, the replacement shall consist of a reinforced Class "A" concrete slab with a minimum thickness of six (6) inches. The type of finish for the replaced section shall be the same as that appearing on the old pavement. Reinforcement shall be #4 bars at 12 inches each way. Any other type shall be replaced with like or better replacement.

7. REPLACING SIDEWALKS

On all sidewalk pavements, the replacement shall consist of a reinforced Class "A" concrete slab (minimum) four (4) inches thick. The type of finish for the replaced section shall be the same as that appearing on the

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old sidewalk. Replacement shall, in general, be to original joint or score marks. Reinforcement shall be #4 bars at 12 inches each way on centers, located at mid-depth in the slab 4" x 4" - W2.9 x W2.9 welded wire fabric. Shell or asphalt sidewalks shall be replaced with caliche or asphalt surface.

8. REPLACING CURB AND GUTTER

On all curb and gutter, the replacement shall consist of a section conforming in all details to the original section or the Owner's Standard if required by the Engineer. Cuts through the curb shall be replaced with Class "A" concrete. Preserve original steel and reinforce all new curbs with three #4 bars. Adjust grades for positive drainage.

9. REPAIRING STREET SHOULDERS AND UNIMPROVED STREETS

On streets or roads without curb and gutter where a shoulder is disturbed, it shall be restored to like or better condition. The shoulder surface shall be rolled to an acceptably stable condition.

10. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 025210 LIME STABILIZATION

1. DESCRIPTION

This specification shall consist of treating the subgrade, sub base or base by the pulverizing, addition of lime, mixing and compacting the mixed material to the required density. This specification applies to natural ground, embankment, existing pavement structure, or proposed base and shall be constructed as specified herein and in conformity with the typical sections, lines and grades as shown on the plans or as established by the Engineer.

2. MATERIALS

- (1) The lime shall be a commercially produced "Hydrated Lime" in accordance with AASHTO M216 or Type A in accordance with TEX Item 264. The specifications apply specifically to the normal hydrate of lime made from "high-calcium" type limestone. Hydrated lime for stabilization purposes shall be applied as a slurry.
- (2) Lime to be used for the treated subgrade, existing sub base, existing base or proposed base is determined by preliminary tests and shall be applied at a rate indicated on the plans.

3. EQUIPMENT

The machinery, tools and equipment necessary for proper prosecution of the work shall be on the project and approved by the Engineer prior to the beginning of construction operations.

All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

Hydrated lime shall be stored and handled in closed weatherproof containers until immediately before distribution on the road. If storage bins are used, they shall be completely enclosed. Hydrated lime in bags shall be stored in weatherproof buildings with adequate protection from ground dampness. If lime is furnished in trucks, each truck shall have the weight of lime certified on public scales.

If lime is furnished in bags, each bag shall bear the manufacturer's certified weight. Bags varying more than 5 percent from that weight may be rejected and the average weight of bags in any shipment, as shown by weighing 50 bags taken at random, shall not be less than the manufacturer's certified weight.

4. CONSTRUCTION METHODS

<u>General</u> – It is the primary requirement of this specification to secure a completed course of treated material containing a uniform lime mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.

<u>Application</u> – Lime shall be spread only on that area where the first mixing operations can be completed during the same working day.

Unless otherwise shown on drawings, lime shall be applied at a rate in pounds of dry-hydrated lime per square yards, in the form of a slurry. Application rate may be varied by the engineer, if conditions warrant.

Certification of lime quantity and quality shall be provided as required to monitor the application. Certification should be in the form of weight tickets which indicate the actual weight of dry hydrated lime, CA(OH)2.

The application and mixing of lime with the material shall be accomplished by the method hereinafter described.

The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry.

Mixing – The mixing procedure shall be as hereinafter described.

- (a) **First Mixing:** The material and lime shall be thoroughly mixed by approved road mixers or other approved equipment, and the mixing continued until, in the opinion of the Engineer, a homogeneous, friable mixture of material and lime is obtained, free from all clods or lumps. Materials containing plastic clays or other material which will not readily mix with lime shall be mixed as thoroughly as possible at the time of the lime application, brought to the proper moisture content and left to cure 1 to 4 days as directed by the Engineer. During the curing period, the material shall be kept moist as directed.
- (b) **Final Mixing**: After the required curing time, the material shall be uniformly mixed by approved methods. If the soil binder-lime mixture contains clods, they shall be reduced in size by raking, blading, disking, harrowing, scarifying or the use of other approved pulverization methods so that, when all nonslaking aggregates retained on the No. 4 sieve are removed, the remainder of the material shall meet the following requirements when tested dry by laboratory sieves:

	Percent
Minimum Passing 1" Sieve	100
Minimum Passing No. 4 Sieve	85

Old bituminous wearing surface shall be pulverized so that 100% will pass a 2" sieve.

During the interval of time between applications and mixing, hydrated lime that has been exposed to the open air for a period of 6 hours or more or to excessive loss due to washing or blowing will not be accepted for payment.

<u>Compaction</u> – Compaction of the mixture shall begin immediately after final mixing and in no case later than 3 calendar days after final mixing, unless approval is obtained from the Engineer. The material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted as hereinafter specified.

If the total thickness of the material to be treated cannot be mixed in one operation, the previously

mixed material shall be bladed to a windrow just beyond the area to be treated and the next layer mixed with lime as previously specified. The first layer of the material shall be compacted such that the treated material will not be mixed with the underlying material.

The course shall be sprinkled as required to maintain moisture content on the wet side of optimum and compacted to the extent necessary to provide the specified density. Unless shown otherwise on the drawings, all lime treated subgrades, sub bases, and bases are not in direct contact with surface or binder course shall be compacted to a minimum of 98% Standard Proctor (AASHTO T99).

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests as necessary will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.

<u>Rework</u>, when required to meet pulverization requirements or density, shall include the addition of lime, about 10% to 15% of the initial application rate or as deemed necessary by the Engineer. A new optimum density will be obtained.

Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface, upon completion, shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades.

5. MEASUREMENT & PAYMENT

Unless indicated otherwise in the Proposal, Lime for stabilization of bases, sub bases and subgrade shall be measured by the square yards.

Pulverizing, mixing, watering grading, compacting, working material etc., shall not be measured for pay but shall be subsidiary to other work.

SECTION 025223 FLEXIBLE BASE

1. DESCRIPTION

This Specification shall govern all work for furnishing and placing Flexible Base required to complete the project.

2. MATERIAL

The material shall consist of crushed limestone produced from oversize quarried aggregate, sized by crushing and produced from a naturally occurring single source, meeting the requirements for Type 'A' material as specified in Texas Department of Transportation (TxDOT) Specification Item 247 "Flexible Base". Crushed gravel or uncrushed gravel shall <u>not</u> be acceptable. No blending of sources and/or additive materials will be allowed. The material shall be free of vegetation and shall be approved by the Engineer. All acceptable material shall be screened and the oversize shall be crushed and returned to the screened material in such a manner that a uniform product will be produced which meets all physical requirements for Grade 1-2 as specified in TxDOT Specification Item 247 "Flexible Base".

3. TESTING

The Owner will engage a laboratory and pay for one test each in the following categories: gradation, liquid limit, plasticity index, modified proctor, moisture-density relation, CBR, and necessary field densities. The Engineer may call for additional tests at any time. The cost of all retests, in case of failure to meet specifications, will be deducted from the Contractor's payment. The Owner will pay for proctor and soil constants and abrasion tests, at the rate of one test for each 1,500 square yards. If material changes and this ratio of one test increases, the Contractor shall pay the cost of additional tests required by the Engineer. The Engineer may waive testing and/or lime admix for small amounts for unimportant uses.

4. CONSTRUCTION METHODS

Prior to placement of flexible base, the surface of the previous course shall be finished true to line and grade as established, and in conformity with the typical section shown on the plans. Grade tolerance shall be generally 1/2 inch, and highs and lows must approximately balance.

Flexible base shall be delivered and spread the same day if possible (no later than the next day).

Base shall be mixed as required to produce a uniform mixture with water. Base shall be placed in uniform lifts not to exceed 6 inches and compacted to a minimum of 95 percent Modified Proctor density (ASTM D1557 or AASHTO T180) at a moisture content of not less than two (2) percent below optimum moisture nor more than 2 percent above optimum moisture.

The surface of the compacted base, after meeting moisture/density requirements, shall be primed in accordance with Standard Specification Section 025412 "Prime Coat".

On completion of compaction and priming, the surface shall be smooth and conform to lines, grades, and sections shown on the plans. Areas with any deviation in excess of 1/4 inch in cross-section and in lengths of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping, and recompacting by repriming and rolling.

Moisture and density shall be maintained until the paving is complete.

5. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 025410 ASPHALT CRACK SEALING (S-36)

1. DESCRIPTION

This item establishes the requirements for the performance of all work necessary for asphalt crack sealing.

2. MATERIALS

1) Asphalt Material - The asphalt material for crack sealing shall be RC-2 with one percent (1%) antistripping agent added as directed by the Engineers. The temperature range for the material shall be 125 - 200 F (51.7 - 93.3 C) when applied.

2) Aggregate for Blotting - "Buckshot Aggregate" or Sand shall be clean and dry and conform to the following gradation:

Sieve Size	Percent Passing
No. 4 (4.75 mm)	90 - 100
No. 10 (2.00 mm)	0 – 15

3. CONSTRUCTION METHOD

 Cleaning - All cracks shall be thoroughly cleaned of undesirable material by the use of an 85 to 90 CFM (2.4 to 2.6 cubic meter per minute) (Minimum Size) air compressor with hoses and attachments.
Filling Procedure - After all cracks have been thoroughly cleaned, the operator of the hand hose shall apply hot liquid asphalt and then the blotting aggregate to the cleaned cracks. Application of the liquid asphalt and blotting aggregate shall be done in such a manner to avoid an accumulation of excess material on areas adjacent to the cracks. Excess material on the cracked areas shall be removed by means of a U - shaped squeegee.

4. MEASUREMENT & PAYMENT

Unless indicated otherwise in the Proposal, ASPHALT CRACK SEALING shall be measured by the square yard in place to the limits shown on the plans and as directed by the Engineer. The work shall include all labor, equipment and materials necessary to complete the work.

SECTION 025412 PRIME COAT

1. DESCRIPTION

This specification shall consist of an application of asphalt material on the completed base course and/or other approved area in accordance with this specification.

Prime Coat shall not be applied when the air temperature is below 60° F and falling, but it may be applied when the air temperature is above 50° F and is rising; the air temperature being taken in the shade and away from artificial heat. Asphalt material shall not be placed when general weather conditions, in the opinion of the Engineer, are not suitable.

2. MATERIALS

The asphalt material used for the prime coat shall be MC-30 medium-curing cutback asphalt or AE- P asphalt emulsion prime, unless otherwise specified, and when tested by approved laboratory methods shall meet the requirements of Standard Specification Section 025404 "Asphalts, Oils and Emulsions". Blotter material shall be native sand.

3. CONSTRUCTION METHODS

When, in the opinion of the Engineer, the area and/or base is satisfactory to receive the prime coat, the surface shall be cleaned of dirt, dust, and other deleterious matter by sweeping or other approved methods. If found necessary by the Engineer, the surface shall be lightly sprinkled with water just prior to application of the asphalt material. The asphalt material shall be applied on the clean surface by an approved type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution. The Contractor shall provide all necessary facilities for determining the temperature of the asphalt material in all of the heating equipment and in the distributor, for determining the rate at which it is applied, and for securing uniformity at the junction of two distributor loads.

All storage tanks, piping, retorts, booster tanks and distributors used in storing or handling asphalt material shall be kept clean and in good operating condition at all times, and they shall be operated in such manner that there will be no contamination of the asphalt material with foreign material. It shall be the responsibility of the Contractor to provide and maintain in good working order a recording thermometer at the storage-heating unit at all times. The distributor shall have been recently calibrated and the Engineer shall be furnished an accurate and satisfactory record of such calibration. After beginning of the work, should the yield on the asphalt material applied appear to be in error, the distributor shall be calibrated in a manner satisfactory to the Engineer before proceeding with the work.

Prime shall be applied at a temperature within the recommended range per Standard Specification Section 025404 "Asphalts, Oils and Emulsions", with that range being 70 to 150 degrees F. Application rate shall be not less than 0.15 gallon per square yard, unless otherwise specified. The Contractor shall be responsible for the maintenance of the surface until the Engineer accepts the work.

Prime Coat

No traffic hauling or placement of any subsequent courses shall be permitted over the freshly applied prime coat until authorized by the Engineer. Spread blotter material before allowing traffic to use a primed surface.

Allow sufficient time for the prime coat to cure properly before applying surface treatment or asphaltic concrete pavement.

4. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 025424 HOT MIX ASPHALTIC CONCRETE PAVEMENT (Class A) TYPE D

1. DESCRIPTION

This specification shall govern all work required for furnishing and laying Hot Mix Asphalt Concrete (HMAC) surface, binder and base courses required to complete the project.

2. MATERIALS

2.1. <u>Aggregate</u>. The aggregate shall consist of a blend of course aggregate, fine aggregate and, if required, a mineral filler.

2.1.1. Coarse Aggregate shall consist of that fraction of aggregate retained on a No. 10 sieve and shall consist of crushed furnace slag, crushed stone, or crushed gravel.

Deleterious material in course aggregate shall not exceed 2% per TxDOT Test Method TEX-217-F.

Course aggregate shall be crushed such that a minimum of 85% of the particles have more than one crushed face, unless noted otherwise on the plans.

Los Angeles abrasion losses for course aggregate shall not exceed 40% by weight for the surface course and 45% for the binder and base courses per TxDOT Test Method TEX-410-A.

Polish Value not less than 30 for aggregate used in the surface course per TxDOT Test Method TEX-438-A.

2.1.2. Fine Aggregate is defined as the fraction passing a No. 10 sieve and shall be of uniform quality.

Fine aggregate shall consist of screenings of material that pass the Los Angeles abrasion requirements in paragraph 2.1.1 above. Screenings shall be blended with a maximum of 15% uncrushed aggregate or field sand for Type D mixes, or a maximum of 10% uncrushed aggregate or field sand for Type A, B, and C mixes.

Grading of fine aggregate shall be as follows:

<u>Sieve Size</u>	Percent Passing by Weight
No. 10	100
No. 200	0-15

2.1.3 Filler shall consist of dry stone dust, Portland cement, hydrated lime, or other mineral dust approved by the Engineer.

Grading of filler shall be as follows:

<u>Sieve Size</u>	Minimum Percent Passing by Weig	ht
No. 30	95	
No. 80	75	
No. 200	55	

2.2. <u>Reclaimed Asphalt Pavement (RAP)</u>. Reclaimed asphalt pavement may be incorporated into the hot mix asphalt concrete furnished for the project, provided that the mixture is designed per the TxDOT Methods and meets the applicable provisions of said TxDOT Item 340 and this specification.

2.3. <u>Asphalt</u>. Asphalt Material shall be in accordance with Standard Specification Section 025404 "Asphalt, Oils and Emulsions" and AASHTO.

2.3.1. Paving Mixture:

APPLICATION	ASPHALT GRADE
Residential or low volume	PG 64-22
Collector	
Surface Course	PG 70-22
Binder Course	PG 64-22
Arterial	
Surface Course	PG 76-22
Binder Course	PG 64-22
Base Courses	PG 64-22
Dase courses	10 04-22

2.3.2. Tack Coat shall consist of an emulsion, SS-1 diluted with equal volume of water and applied at a rate ranging from 0.05 to 0.15 gallon per square yard.

3. PAVING MIXTURE

3.1. <u>Mix Design</u>. The mixture shall be designed in accordance with TxDOT Bulletin C-14 and TxDOT Test Method TEX-204-F to conform to the requirements of this specification. The Contractor shall furnish the mix design for the job-mix to be used for the project, unless shown otherwise on the drawings. The mix design shall be submitted prior to placement of the mixture.

The design procedures are intended to result at a job-mix with properties in compliance with these specifications, and when properly placed the job-mix will be durable and stable. The sieve analysis of the job-mix shall be within the range of the Master Gradation and Tolerances specified herein. The job-mix shall meet the density and stability requirements as specified and shall be included with the mix design as submitted per above.

If the specific gravity of any of the types of aggregates differs by more than 0.3, use volume method.

Plot sieve analysis of job-mix; percent passing versus size on four-cycle semi-log paper or other appropriate type paper. Show tolerance limits and Limits of Master Gradation.

3.2. <u>Master Gradation of Aggregate</u>. The aggregate for the type of mix specified shall be within the following tabulated limits per TxDOT Test Method TEX-200-F (Dry Sieve Analysis):

	Туре				
Sieve	А	В	С	D	
5120	Course Base	Fine Base	Course Surface	Fine Surface	
1-1/2"	100				
1-1/4"	95-100				
1"		100			
7/8"	70-90	95-100	100		
5/8"		75-95	95-100		
1/2"	50-70			100	
3/8"		60-80	70-85	85-100	
1/4"					
No. 4	30-50	40-60	43-63	50-70	
No. 10	20-34	27-40	30-40	32-42	
No. 40	5-20	10-25	10-25	11-26	
No. 80	2-12	3-13	3-13	4-14	
No. 200	1-6*	1-6*	1-6*	1-6*	
VMA % minimum	11	12	13	14	

* 2-8 when TxDOT Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.

3.3. <u>Tolerances</u>. The mixture delivered to the job site shall not vary from the job-mix by more than the tolerances specified below. The gradation of the produced mix shall not fall outside the Master Grading Limits, with the following exceptions: for Type B material coarser than 3/8" and for Type D material coarser than #4. Variations from job-mix shall not exceed the following limits, except as noted above:

<u>ltem:</u>	Tolerances Percent by Weight or Volume
1" to No. 10	Plus or Minus 5.0
No. 40 to No. 200	Plus or Minus 3.0
Asphalt Weight	Plus or Minus 0.5
Asphalt Volume	Plus or Minus 1.2

3.4. <u>Mix Properties</u>. The mixture shall have a minimum Hveem stability of 40 for Type A, B, and C mixes, and 35 for Type D mixes per TxDOT Test Method TEX-208-F at an optimum density of 96% (plus or minus 1.5) of theoretical maximum density per TxDOT Test Methods TEX-227-F and TEX-207-F.

3.5. <u>Sampling and Testing of Raw Materials</u>. The Contractor shall sample materials as necessary to produce a mix in compliance with these specifications.

4. EQUIPMENT

4.1. <u>Mixing Plants</u>. Mixing plants shall be either the weigh batching type or the drum mix type. Both types shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, aggregate screens and bins (weigh batch only), and pollution control devices as required.

4.2. <u>Truck Scales</u>. A set of truck scales, if needed for measurement, shall be placed at a location approved by the Engineer.

4.3. <u>Asphalt Material Heating Equipment</u>. Asphalt material heating equipment shall be adequate to heat the required amount of material to the desired temperature. Agitation with steam or air will not be permitted. The heating apparatus shall be equipped with a recording thermometer with a 24-hour continuous chart that will record the temperature of the asphalt at the highest temperature.

4.4. <u>Surge-Storage System</u>. A surge-storage system may be used provided that the mixture coming out of the bins is of equal quality to that coming out of the mixer. The system shall be equipped with a gob hopper, rotating chute or other devices designed to minimize segregation of the asphalt mixture.

4.5. <u>Laydown Machine</u>. The laydown machine shall be capable of producing a surface that will meet the requirements of the typical cross section, of adequate power to propel the delivery vehicles, and produce the surface tolerances herein required. It shall be wide enough to lay a 28-foot street (back-to-back of curbs) in a maximum of two passes.

4.6. <u>Rollers</u>. All rollers shall be self-propelled and of any type capable of obtaining the required density. Rollers shall be in satisfactory operating condition and free from fuel, hydraulic fluid, or any other fluid leaks.

5. STORAGE, PROPORTIONING AND MIXING

5.1. <u>Storage and Heating of Asphalt Materials</u>. Asphalt cement shall not be heated to a temperature in excess of that recommended by the producer. Asphalt storage equipment shall be maintained in a clean condition and operated in such a manner that there will be no contamination with foreign matter.

5.2. <u>Feeding and Drying of Aggregates</u>. The feeding of various sizes of aggregate to the dryer shall be done in such a manner that a uniform and constant flow of materials in the required proportions will be maintained. In no case shall the aggregate be introduced into the mixing unit at a temperature more than 350 degrees F.

5.3. <u>Proportioning</u>. All materials shall be handled and proportioned in a manner that yield an acceptable mixture as herein specified and as defined by the <u>job-mix</u>.

5.4. <u>Mixing</u>.

5.4.1. Weigh Batch Plant. In charging the weigh box and in charging the pugmill from the weigh box, such methods or devices shall be used as necessary to minimize segregation of the mixture.

5.4.2. Drum Mix Plant. The amount of aggregate and asphalt cement entering the mixer and the rate of travel through the mixer shall be coordinated so that a uniform mixture of the desired gradation and asphalt content will be produced.

5.4.3. The mixture produced from each type of plant shall not vary from the <u>job-mix</u> by more than the tolerances and restrictions herein specified. The mixture when discharged from the plant shall have a moisture content not greater than one percent by weight of total mix when determined by TxDOT Test Method TEX-212-F.

5.4.4. The mixture produced from each type of plant shall be at a temperature between 250 and 325 degrees F. After a target mixing temperature has been established, the mixture when discharged from the mixer shall not vary from this temperature by more than 25 degrees F.

6. CONSTRUCTION METHODS

6.1. <u>Construction Conditions</u>. For mat thicknesses greater than 1.5 inches, the asphalt material may be placed with a laydown machine when the air temperature is 40 degrees F and rising but not when the air temperature is 50 degrees F and falling. In addition, mat thickness less than and including 1.5 inches shall not be placed when the temperature of the surface on which the mat is placed is below 50 degrees F.

6.2. <u>Prime Coat</u>. If a prime coat is required, it shall be applied and paid for as a separate item conforming to the requirements of Standard Specification Section 025412 "Prime Coat", except the application temperature shall be as provided above. The tack coat or asphaltic concrete shall not be applied on a previously primed flexible base until the primed base has completely cured to the satisfaction of the Engineer.

6.3. <u>Tack Coat</u>. Before the asphalt mixture is laid, the surface upon which the tack coat is to be placed shall be thoroughly cleaned to the satisfaction of the Engineer. The surface shall be given a uniform application of tack coat using materials and rates herein specified and/or as shown on the plans. The tack coat shall be rolled with a pneumatic tire roller as necessary.

6.4. <u>Transporting Asphalt Concrete</u>. The asphalt mixture shall be hauled to the job site in tight vehicles previously cleaned of all foreign matter. In cool weather or for long hauls, canvas covers and insulated truck beds may be necessary. The inside of the bed may be given a light coating of lime water or other suitable release agent necessary to prevent from adhering. Diesel oil is not allowed.

6.5. <u>Placing</u>. The asphalt mixture shall be spread on the approved prepared surface with a laydown machine or other approved equipment in such a manner that when properly compacted, the finished surface will be smooth and of uniform density, and meet the requirements of the typical cross section as shown on the plans.

6.5.1. Flush Structures. Adjacent to flush curbs, gutters, liners and structures, the surface shall be finished uniformly high so that when compacted, it will be slightly above the edge of the curb and flush structure.

6.5.2. Construction joints of successive courses of asphaltic material shall be offset at least six inches. Construction joints on surface courses shall coincide with lane lines, or as directed by the Engineer.

6.6. <u>Compacting</u>. The asphalt mixture shall be compacted thoroughly and uniformly with the necessary rollers to obtain the required density and surface tolerances herein described and any requirements as shown on the plans. Regardless of the method of compaction control followed, all rolling shall be completed before the mixture temperature drops below 175 degrees F.

6.7. <u>In-Place Density</u>. In-place density control is required for all mixtures except for thin, irregular level-up courses. Material should be compacted to between 96% and 92% of maximum <u>theoretical density</u> or between 4% and 8% air voids. <u>Average density shall be greater than 92% and no individual determination shall be lower than 90%</u>. Testing shall be in accordance with TxDOT Test Methods TEX-207-F and TEX-227-F.

Pavement specimens, which shall be either cores or sections of the compacted mixture, will be tested as required to determine the percent air voids. Other methods, such as nuclear determination of in-place density, which correlate satisfactorily with actual project specimens may be used when approved by the Engineer.

6.8. <u>Thickness</u>. The total compacted average thickness of the combined HMAC courses shall not be less than the amount specified on the drawings. No more than 10% of the measured thickness(es) shall be more than 1/4 inch less than the plan thickness(es). If so, the quantity for pay shall be decreased as deemed appropriate by the Engineer.

6.9. <u>Surface Smoothness Criteria and Tests</u>. The pavement surface after compaction, shall be smooth and true to the established lines, grade and cross-section. The surface shall be tested by

the Owner with the Mays Roughness Meter. The Mays Roughness Value for each 600-foot section shall not exceed ninety inches per mile per traffic lane.

Localized defects (obvious settlements, humps, ridges, etc.) shall be tested with a ten-foot straightedge placed parallel to the roadway centerline. The maximum deviation shall not exceed 1/8 inch in ten feet. Areas not meeting this criterion shall be corrected to the satisfaction of the Engineer.

6.10. <u>Opening to Traffic</u>. The pavement shall be opened to traffic when directed by the Engineer. The Contractor's attention is directed to the fact that all construction traffic allowed on pavement open to the public will be subject to the State laws governing traffic on highways.

If the surface ravels, it will be the Contractor's responsibility to correct this condition at his expense.

7. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 025610 CONCRETE CURB AND GUTTER

1. DESCRIPTION

This specification shall consist of Portland cement concrete combined concrete curb and gutter or separate concrete curb with or without reinforcing steel as required, constructed on an approved subgrade or foundation material in accordance with these specifications, in conformity with the lines and grades established by the Engineer and details shown on the plans.

2. MATERIALS

Unless otherwise specified on the plans, materials and proportions for concrete used in construction under this specification shall conform the requirements as specified for Class "A" Concrete under specification Section 030020 "Portland Cement Concrete". Reinforcing steel, if required, shall conform to the requirements as specified in specification Section 032020 "Reinforcing Steel". Expansion joint filler shall be wood fiber asphalt-impregnated expansion board material.

3. CONSTRUCTION METHODS

The foundation shall be excavated and shaped to line, grade and cross-section and, if considered necessary in the opinion of the Engineer, hand tamped and sprinkled. If dry, the subgrade or foundation material shall be sprinkled lightly with water immediately before concrete is deposited thereon.

Outside forms shall be of wood or metal, of a section satisfactory to the Engineer, straight, free of warp, and a depth equal to the depth of the curb and gutter. They shall be securely staked to line and grade, and maintained in a true position during the depositing of concrete. Inside forms for the curb shall be approved material, shall be of such design as to provide the curb required, and shall be rigidly attached to the outside forms. Where specifically permitted by the Engineer in writing, the Contractor may place concrete curb and gutter with an extrusion machine.

The reinforcing steel, if required, shall be placed in position as shown on the typical details. Care shall be exercised to keep all reinforcing steel in its proper location.

Concrete for curb and gutter shall be mixed in a manner satisfactory to the Engineer. The curb and gutter shall be placed in sections of the length indicated on the plans, and each section shall be separated by a premolded insert or board joint of cross-section specified for the curb and gutter, and of the thickness indicated on the plans.

After the concrete has been struck off and after it has become sufficiently set, the exposed surfaces shall be thoroughly worked with a wooden float. The exposed edges shall be rounded by the use of an edging tool to the radius indicated on the plans. All exposed surfaces of curb and gutter, or curb, shall be brushed to a smooth and uniform surface.

The completed curb and gutter shall be cured with Type 2, white pigmented, curing compound unless shown otherwise on the plans. Other methods of curing as outlined in specification Section 038000 "Concrete Structures" will be acceptable with a required curing period of 72 hours.

The curb and gutter shall be backfilled to the full height of the curb, tamped and sloped as directed.

4. MEASUREMENT AND PAYMENT

Payment shall be full compensation for all labor, equipment, tools and incidentals necessary for the work prescribed in this specification and payment will be part of the project lump sum bid.

SECTION 025614 CONCRETE CURB RAMPS

1. DESCRIPTION

This specification shall govern all work necessary for constructing Concrete Curb Ramps required to complete the project.

2. MATERIALS

Concrete shall be class "A" in accordance with Section 030020 of the Standard Specifications.

Unless shown otherwise on the Drawings, reinforcement shall be 4x4 - W2.9 welded wire fabric in accordance with Section 032020 of the Standard Specifications.

3. CONSTRUCTION METHODS

The subgrade shall be shaped to line, grade, cross section, and shall be of uniform density and moisture, when concrete is placed. The subgrade shall be hand tamped and sprinkled to achieve the desired consistency and uniform support.

Ramps shall be constructed of Class A concrete to line and section as shown on the plans. Unless shown otherwise on the Drawings, ramps shall have a minimum concrete thickness in excess of 4", prior to application of exposed aggregate surface texture.

Slopes, S, shall be as follows unless shown otherwise on the Drawings:

RAMPS	
Ramp in direction of travel	S <u>< 1</u> :12
Side slope of ramp (flare)	S <u>< 1</u> :10
Cross Slope	1:100 <u>< </u> S <u>< 1</u> :50
ADJOINING AREAS	
Landings adjacent to ramp	S <u>< 1</u> :20
Driveways abutting tied sidewalk	S <u>< 1</u> :10

Width of ramp shall be 36", exclusive of flare, unless shown otherwise in the Drawings. No ramp shall be less than 36" wide.

Obstructions shall be removed or relocated, as appropriate, or the location of the ramp may be shifted, if authorized.

Surfacing shall be the little domes. Surfacing shall be flush with abutting areas. Surfacing shall be subsidiary work and not be measured for separate pay. Abutting curbs, sidewalks, gutters, driveways, etc. shall not receive granite surfacing.

Pavement Markings for street crossings shall be placed such that the crosswalk is properly aligned with respect to the curb ramp. See striping details for proper alignment of striping with respect to intersection and curb ramp. Properly constructed curb ramp shall be true to line, section, and grade and shall be free of loose granite surfacing and irregularities.

4. MEASUREMENT AND PAYMENT

Measurement and payment shall be as stated in the Special Provisions and/or as indicated in the bid forms.

SECTION 025802 TEMPORARY TRAFFIC CONTROLS DURING CONSTRUCTION

1. DESCRIPTION

This specification shall govern all work required for Temporary Traffic Controls During Construction. The work shall include furnishing, installing, moving, replacing, and maintaining all temporary traffic controls including, but not limited to, barricades, signs, barriers, cones, lights, signals, temporary striping and markers, flagmen, and such temporary devices as necessary to safely complete the project.

2. MATERIALS

Traffic control devices shall conform to the Texas Manual on Uniform Traffic Control Devices (latest edition), unless indicated otherwise on the Traffic Control Plan.

3. METHODS

Sufficient traffic control measures shall be used to assure a safe condition and to provide a minimum of inconvenience to motorists and pedestrians.

A Traffic Control Plan (TCP) is included in the drawings.

A competent person, responsible for implementation of the TCP, maintaining the temporary traffic control devices and for traffic safety during construction, shall be designated by the Contractor.

The name and off-hours phone number of the competent person shall be provided in writing at the Pre-Construction Conference.

The competent person shall be on site, during working hours and on call at all times in the event of off-hour emergency.

4. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 027402 REINFORCED CONCRETE PIPE CULVERTS

1. DESCRIPTION

This specification shall govern the furnishing and placing of reinforced concrete pipe culverts and the material and incidental construction requirements for reinforced concrete pipe sewers. The culvert pipe shall be installed in accordance with the requirements of these specifications to the lines and grades shown on the plans, and shall be of the classes, sizes and dimensions shown thereon. The installation of pipe shall include all joints or connections to new or existing pipe, headwalls, etc., as may be required to complete the work.

2. MATERIALS

2.1 GENERAL

Except as modified herein, materials, manufacture and design of pipe shall conform to ASTM C-76 for Circular Pipe. All pipe shall be machine made or cast by a process which will provide for uniform placement of the concrete in the form and compaction by mechanical devices which will assure a dense concrete. Concrete shall be mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete will not be acceptable for use in precast concrete pipe.

2.2 DESIGN

All pipe shall be Class III (Wall "B") unless otherwise specified on the plans. The shell thickness, the amount of circumferential reinforcement and the strength of the pipe shall conform to the specified class as summarized in ASTM C-76 for Circular Pipe.

2.3 SIZES AND PERMISSIBLE VARIATIONS

a. Variations in diameter, size, shape, wall thickness, reinforcement, placement of reinforcement, laying length and the permissible underrun of length shall be in accordance with the applicable ASTM Specification for each type of pipe as referred to previously.

b. Where rubber gasket pipe joints are to be used, the design of the Joints and Permissible Variations in Dimensions shall be in accordance with ASTM C-443.

2.4 WORKMANSHIP AND FINISH

Pipe shall be substantially free from fractures, large or deep cracks and surface roughness. The ends of the pipe shall be normal to the walls and centerline of the pipe within the limits of variations allowed under the applicable ASTM specification.

2.5 CURING

Pipe shall be cured in accordance with the applicable ASTM Specification for each type of pipe as referred to above.

2.6 MARKING

The following information shall be clearly marked on each section of pipe:

- a. The class of pipe.
- b. The date of manufacture.
- c. The name or trademark of the manufacturer.

d. Marking shall be indented on the pipe section or painted thereon with waterproof paint.

2.7 MINIMUM AGE FOR SHIPMENT

Pipe shall be considered ready for shipment when it conforms to the requirements of the tests specified herein.

2.8 INSPECTION

The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the Engineer at the pipe manufacturing plant. In addition, the finished pipe shall be subject to further inspection by the Engineer at the project site prior to and during installation.

2.9 CAUSES FOR REJECTION

Pipe shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual sections of pipe may be rejected because of any of the following:

a. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.

- b. Defects that indicate imperfect proportioning, mixing and molding.
- c. Surface defects indicating honeycombed or open texture.
- d. Damaged ends, where such damage would prevent making a satisfactory joint.

2.10 REPAIRS

Pipe may be repaired if necessary, because of occasional imperfections in manufacture or accidental injury during the handling, and will be acceptable if, in the opinion of the Engineer, the repairs are sound and properly finished and cured and the repaired pipe conforms to the requirements of the specifications.

2.11 REJECTIONS

All rejected pipe shall be plainly marked by the Engineer and shall be replaced by the Contractor with pipe that meets the requirements of these specifications. Such rejected pipe shall be removed immediately from the worksite.

2.12 JOINTING MATERIALS

Unless otherwise specified on the plans, the Contractor shall have the option of making the joints by any of the following methods:

a. Ram-Nek, a pre-formed plastic base joint material manufactured by K. T. Knyder Company, Houston, Texas, or an approved equal. Use of Talcote as joint material will not be not permitted. Ram-Nek joint material and primer shall be supplied for use on pipe in the following sizes, which is the minimum that will be required.

Additional Ram-Nek may be required if, in the opinion of the Engineer, a proper joint is not secured.

<u>Pipe Size</u>	Primer Per 100 Jts.	Cut Lengths Per Joint
12"	1.5 gals.	½ pcs 1" x 2'-5"
15"	1.9 gals.	2 pcs 1" x 2'-5"
18"	2.7 gals.	1½ pcs 1½ " x 3'-5"
21"	3.8 gals.	2 pcs 1½ " x 3'-5"
24"	6.2 gals.	2 pcs 1½ " x 3'-5"
30"	8.5 gals.	2½ pcs 1½ " x 3'-5"
36"	9.5 gals.	3 pcs 1¾" x 3'-5"
42"	12.0 gals.	3½ pcs 1¾" x 3'-5"
48"	15.0 gals.	4 pcs 1¾" x 3'-5"
54"	20.0 gals.	4½ pcs 1¾" x 3'-5"
60"	25.0 gals.	5 pcs 1¾" x 3'-5"
66"	30.0 gals.	5½ pcs 1¾" x 3'-5"
72"	32.0 gals.	6 pcs 2" x 3'-5"
84"	35.0 gals.	7 pcs 2" x 3'-5"

b. TYLOX Types "C", "C-P" or "CR" rubber gaskets, as applicable, as manufactured by Hamilton Kent Manufacturing Company, Kent, Ohio, or approved equal. All gaskets, lubricants, adhesives, etc., shall be manufactured, constructed, installed, etc., as recommended by the manufacturer of the rubber gasket material and conform to ASTM Designation: C-443. In addition, the Contractor shall furnish to the City, for approval, manufacturer's brochures detailing the complete use, installation, and specifications of concrete pipe and rubber gaskets before any rubber gasket material is used on the project. All rubber gaskets shall be fabricated from synthetic rubber.

c. Cement Mortar is prohibited from jointing pipe except at manholes, pipe junctions, etc., or where specifically approved by the Engineer.

d. Geotextile for wrapping pipe joints shall be Class "A" subsurface drainage type in accordance with AASHTO M288.

3. CONSTRUCTION METHODS

Reinforced concrete pipe culverts shall be constructed from the specified materials in accordance with the following methods and procedures:

3.1 EXCAVATION

All excavation shall be in accordance with the requirements of Specification Section 022020 "Excavation and Backfill for Utilities," except where tunneling or jacking methods are shown on the plans or permitted by the Engineer.

When pipe is laid in a trench, the trench, when completed and shaped to receive the pipe, shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of the backfill and bedding material under and around the pipe. The Contractor shall make such temporary provisions as may be necessary to insure adequate drainage of the trench and bedding during the construction operation. Pipe shall be placed such that the identification markings are visible at the top prior to backfill.

3.2 BEDDING

The pipe shall be bedded in accordance with the bedding details shown on the drawings. Bedding shall not be measured for pay, but shall be subsidiary to other work. If the subgrade of the trench is unstable, even if this condition occurs at relatively shallow depths, full encasement of the pipe with crushed stone shall be required.

3.3 LAYING PIPE

Unless otherwise authorized by the Engineer, the laying of pipe on the prepared foundation shall be started at the outlet (downstream) end with the spigot or tongue end pointing downstream, and shall proceed toward the inlet (upstream) end with the abutting sections properly matched, true to the established lines and grades. Where bell and spigot pipe are used, cross trenches shall be cut in the foundation to allow the barrel of the pipe to rest firmly upon the prepared bed. These cross trenches shall be not more than two inches larger than the bell ends of the pipe. Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without disturbing the prepared foundation and the sides of the trench. The ends of the pipe shall be carefully cleaned before the pipe is placed. As each length of pipe is laid, the mouth of the pipe shall be protected to prevent the entrance of earth or bedding material. The pipe shall be fitted and matched so that when laid in the bed, it shall form a smooth, uniform conduit. When elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, the pipe shall be laid in the trench in such position that the markings "TOP" or "BOTTOM" shall not be more than 5 degrees from the vertical plane through the longitudinal axis of the pipe.

For pipe over 42 inches in diameter, the Contractor may drill two holes not larger than 2 inches in diameter, in the top of each section of the pipe, to aid in lifting and placing.

The holes shall be neatly drilled, without spalling of the concrete, and shall be done without the cutting of any reinforcement. After the pipe is laid, the holes shall be filled with mortar and properly cured, and placed such that they are visible from the top for inspection prior to backfill.

Multiple installations of reinforced concrete pipe shall be laid with the center lines of individual barrels parallel. When not otherwise indicated on plans, the following clear distances between outer surfaces of adjacent pipe shall be used.

Diameter of Pipe	18"	24"	30"	36"	42"	48"	54"	60" to 84"
Clear Distance Between Pipes	0'-9"	0'-11"	1'-1"	1'-3"	1'-5"	1'-7"	1'-11"	2'-0"

1. Jointing.

a. If the use of Portland cement mortar joints is allowed, all pipe shall be jointed tight and sealed with stiff mortar, composed of one part Portland cement and two parts sand, so placed as to form a durable water-tight joint. The installation shall be as required by the Engineer.

b. Joints using Rubber Gaskets: Where rubber gasket pipe joints are required by the plans, the joint assembly shall be made according to the recommendations of the gasket manufacturer. Water-tight joints will be required when using rubber gaskets.

c. Joints using Cold-Applied Preformed Plastic Gaskets shall be made as follows:

A suitable prime of the type recommended by the manufacturer of the gasket joint sealer shall be brush-applied to the tongue and groove joint surfaces and the end surfaces and allowed to dry and harden. No primer shall be applied over mud, sand or dirt or sharp cement protrusions. The surface to be primed must be clean and dry when primer is applied.

Before laying the pipe in the trench, the plastic gasket sealer shall be attached around the tapered tongue or tapered groove near the shoulder or hub of each pipe joint. The paper wrapper shall be removed from one side only of the two-piece wrapper on the gasket and pressed firmly to the clean, dry pipe joint surface. The outside wrapper shall not be removed until immediately before pushing the pipe into its final position.

When the tongue is correctly aligned with the flare of the groove, the outside wrapper on the gasket shall be removed and the pipe shall be pulled or pushed home with sufficient force and power (backhoe shovel, chain hoist, ratchet hoist or winch) to cause the evidence of squeeze-out of the gasket material on the inside or outside around the complete pipe joint circumference. The extruded gasket material shall be smoothed out over the joint on the exterior and interior of the pipe. Any joint material pushed out into the interior of the pipe that would tend to obstruct the flow shall be removed. (Pipe shall be pulled home in a straight line with all parts of the pipe on line and grade at all times.) Backfilling of pipe laid with plastic gasket joints may proceed as soon as the joint has been inspected and approved by the Engineer. Special precautions shall be taken in placing and compacting backfill to avoid damage to the joints.

When the atmospheric temperature is below 60 degrees F, plastic joint seal gaskets shall either be stored in an area warmed to above 70 degrees F, or artificially warmed to this temperature in a manner satisfactory to the Engineer. Gaskets shall then be applied to pipe joints immediately prior to placing pipe in the trench, followed by connection to previously laid pipe.

d. Pipe Joints for storm sewers shall be wrapped with geotextile material. The geotextile wrap shall be at least 2 feet wide and shall be centered on each joint.

2. After the pipe has been placed, bedded and jointed as specified, filling and/or backfilling shall be done in accordance with the applicable requirements of Specification Section 022020 "Excavation and Backfill for Utilities." If unstable conditions are encountered, fully encase the pipe with crushed stone as described above. When mortar joints are allowed, no fill or backfill shall be placed until the jointing material has been cured for at least six (6) hours.

Special precautions shall be taken in placing and compacting the backfill to avoid any movement of the pipe or damage to the joints. For side drain culverts and all other culverts where joints consist of materials other than mortar, immediate backfilling will be permitted.

- 3. Unless otherwise shown on the plans or permitted in writing by the Engineer, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 4 feet of permanent or temporary compacted fill has been placed thereon. Pipe damaged by the Contractor's equipment shall be removed and replaced by the Contractor at no additional cost.
- 4. Cleaning and Television Inspection. All enclosed reinforced concrete pipe and manholes installed on this project shall be cleaned and televised in accordance with Specification Section 027611 "Cleaning and Televised Inspection of Conduits."

4. MEASUREMENT

Unless otherwise specified on the Bid Form, reinforced concrete pipe will be measured by the linear foot. Such measurement will be made between the ends of the pipe barrel along its central axis. Where spurs or branches, or connections to existing pipe lines are involved, measurement of the spur or new connecting pipe will be made from the intersection of its center axis with the outside surfaces of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, that length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be so included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels measured as prescribed above.

5. <u>PAYMENT</u>

Payment for reinforced concrete pipe measured as prescribed above will be made at the contract unit price bid per linear foot for the various sizes of "Reinforced Concrete Pipe" of the class specified.

Payment shall be full compensation for furnishing and transporting the pipe; hauling and placing of earth cushion material where required for bedding pipe; for the preparation and shaping of beds; for hauling, placing and jointing of pipes; for furnishing and installing geotextile pipe joint wrapping; for end finish; for all connections to existing and new structures; for cleaning and television inspection; and for all other items of materials, labor, equipment, tools, excavation, backfill and incidentals necessary to complete the culvert or storm sewer in accordance with the plans and these specifications.

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

SECTION 028020 SEEDING

1. DESCRIPTION

This specification shall govern all work necessary for tilling, fertilizing, planting seeds, mulching, watering and maintaining vegetation required to complete the project.

2. MATERIALS

2.1 FERTILIZER

All fertilizer shall be delivered in bags or clearly marked containers showing the analysis, name, trademark and warranty. The fertilizer is subject to testing by the State Chemist in accordance with the Texas fertilizer law. Fertilizer shall have an analysis of 12-12-12 (percent of nitrogen, phosphoric acid and potash) as determined by the Association of Official Agricultural Chemists. Fertilizer shall be free flowing and uniform in composition.

2.2 SEED

Seed shall be labeled and meet the requirements of the Texas Seed Law. Labels shall indicate purity, germination, name and type of seed. Seed furnished shall be of the previous season's crop, and the date of analysis shown on each bag shall be within twelve months of delivery to the project.

The quantity of "Commercial Seed" required to equal the quantity of "Pure Live Seed" shall be computed by the following formula:

Commercial Seed = Pure Live Seed x

<u>10,000</u> % Purity x % Germination

The quantity of pure live seed and type required are indicated below. Mixture A or C shall be used for this project, depending on the time of the year planting is performed.

	LB/ACRE OF PURE LIVE SEED				
	<u>FOR N</u>	<u>1IXTURES</u>			
COMMON NAME	SCIENTIFIC NAME	<u>A</u>	<u>B</u>	<u>C</u>	
Green Sprangletop	Leptochloa Dubia	1.4	1.4	-	
Sideoats Grama (premier)	Bouteloua Curtipendula	0.6	-	0.6	
Bermudagrass (Hulled)	Cynodon Dactylon	7.0	7.4	-	
Bermudagrass (Unhulled)	Cynodon Dactylon	-	-	30.0	
K-R Bluestem	Andropogon Ischaemum	1.2	1.2	1.5	
Buffalograss	Buchloe Dactyloides	-	4.2	-	
Annual Ryegrass	Lolium Multiflorum	5.0	5.0	20.0	

Mixture - A: Recommended for clay or tight soil planted between December 1 thru May 1.

Mixture - B: Recommended for sandy soil planted between December 1 thru May 1.

Mixture - C: Recommended for all soils planted between May 2 thru November 30.

2.3 MULCH

Mulch shall be either the straw type or wood cellulose fiber type.

Straw Type mulch shall be of straw from stalks of domestic grain, Bermudagrass or cotton hulls, or other

approved by the Engineer.

<u>Wood Cellulose Fiber Type</u>- mulch shall have no growth inhibiting ingredients and shall be dried with a moisture content less that 10% by weight. Fibers shall be dyed an appropriate color to facilitate visual metering and application of mulch. The cellulose fiber shall be manufactured so that after addition and agitation in slurry tank with fertilizers, seeds and other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; when sprayed on the ground, the material shall form a uniform cover impregnated with seeds; the cover shall allow added water to percolate to the underlying soil. The fiber material shall be supplied in packages of not more than 100 lb. gross weight and shall be marked by the manufacturer to indicate the dry weight content.

2.4 EQUIPMENT: The fertilizing, seeding and/or mulching operations shall be accomplished with equipment suitable to the required function. It shall be of current design and in good operating condition. Special seeding and mulching equipment must also meet the following requirements:

<u>Seeder</u> - Equipment for applying a seed-fertilizer mix shall be a hydraulic seeder designed to pump and discharge a waterborne, homogeneous slurry of seed and fertilizer. The seeder shall be equipped with a power driven agitator and capable of pressure discharge.

<u>Straw Mulch Spreader</u> - Equipment used for straw mulch application shall be trailer mounted, equipped with a blower capable of 2000 r.p.m. operation, and that will discharge straw mulch material through a discharge boom with spout at speeds up to 220 feet per second. The mulch spreader shall be equipped with an asphalt supply and application system near the discharge end of the boom spout. The system shall apply asphalt adhesive in atomize form to the straw at a predetermined rate. The spreader shall be capable of blowing the asphalt-coated mulch, with a high velocity airstream, over the surface at a uniform rate, forming a porous, stable erosion-resistant cover.

<u>Wood Cellulose Fiber Mulch Spreader</u> - Equipment used for this application of fertilizer, seeds, wood pulp, water and other additives shall have a built-in agitation system with sufficient capacity to agitate, suspend and homogeneously mix a slurry containing up to 40 lbs. of fiber plus the required fertilizer solids for each 100 gallons of water. It shall have sufficient agitation and pump capacity to spray a slurry in a uniform coat over the area to be mulched.

3. CONSTRUCTION METHODS

3.1 PREPARATION OF SEEDBED

The area to be treated along with requirements for seed, fertilizer and other treatments, shall be done as indicated on the drawings and as specified below.

<u>Clearing</u> – Refer to Standard Specification Section 021020, "Site Clearing and Stripping".

Grading - Refer to Standard Specification Section 021040, "Site Grading".

<u>Tilling</u> - The area to be seeded shall be tilled to a depth of 4 to 6 inches by disking, plowing, or other approved methods until soil condition is acceptable.

3.2 FERTILIZING

Fertilizer shall be uniformly applied at a rate of 400 lb/acre, after tilling. Fertilizing and seeding shall be done concurrently. If seeds and fertilizer are distributed in a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all the components have come into contact.

3.3 SEEDING

The seed mixture shall be uniformly distributed at the rate specified above.

<u>Broadcast Seeding</u> - Seed shall be placed with fertilizer, after tilling. After planting, the area shall be rolled on contour with a corrugated roller.

<u>Straw Mulch Seeding</u> - Seed shall be placed with fertilizer, after tilling. After placement of the seed and fertilizer mixture, straw mulch shall be uniformly placed at a rate of 2 tons per acre. As soon as the mulch has been spread, it shall be anchored to the soil a minimum depth of 3 inches by use of a heavy, dulled disk harrow, set nearly straight. Disks shall be set approximately 9 inches apart.

<u>Straw Mulch with Asphalt Seeding</u> - Seed, fertilizer and straw mulch shall be placed as described in "Straw Mulch Seeding" with the following two exceptions: 1) An asphalt-water emulsion shall be applied to the mulch near the discharge end of the boom spout at a rate of 300 to 600 gallons per acre. 2) Mechanical anchoring by disking will not be required.

<u>Asphalt Mulch Seeding</u> - The seed and fertilizer shall be placed as described for "Broadcast Seeding". After the area has been rolled, the area shall be watered sufficiently to assure a uniform moisture to a minimum depth of 4 inches. An asphalt-water emulsion shall be applied at a rate of 1500 to 1800 gallons per acre, immediately after watering. Asphalt shall be applied to the area in such a manner that a complete film is obtained and the finished surface shall be comparatively smooth.

<u>Wood Cellulose Fiber Mulch Seeding</u> - After tilling, mulch shall be applied. Wood cellulose fibers shall be added to the hydraulic seeder after the proportionate amounts of seed, fertilizer, water and other approved materials are added. Application shall be 1500 lb./acre on flats, 2000 lb./acre on slopes up to 3:1, and 2500 lb./acre on slopes steeper than 3:1. One hundred (100) pounds of fiber per acre shall be used when asphalt is to be applied over cellulose mulch. The mulch shall provide a uniform cover over the soil surface.

<u>Asphalt Over Wood Cellulose Fiber Mulch Seeding</u> - "Wood Cellulose Fiber Mulch Seeding" shall be done as described above. After mulch has been placed, an asphalt-water emulsion shall be uniformly spread over the mulch at a rate of 1200 gallons per acre.

3.4 MAINTENANCE

The Contractor shall water, repair and reseed areas as required for a period of 45 days or until growth has been established, whichever is longer. This includes erosion damage. Maintenance does not include mowing or weed control, unless indicated on the plans. If at any time the seeded area becomes gullied or otherwise damaged, or the seeds have been damaged or destroyed, the affected portion shall be re-established to the specified condition prior to acceptance of the work.

3.5 GUARANTEE

The Contractor shall assure 95% of the seeded area has established growth at 45 calendar days after seeding, unless indicated otherwise on the drawings. Where established, growth is defined as at least one plant per square foot with no bare spots larger than ten (10) square feet.

4. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.
SECTION 030020 PORTLAND CEMENT CONCRETE

1. DESCRIPTION

This specification shall govern for the materials used; for the storing and handling of materials; and for the proportioning and mixing of concrete for culverts, manholes, inlets, curb and gutter, sidewalks, driveways, curb ramps, headwalls and wingwalls, riprap, and incidental concrete construction.

The concrete shall be composed of Portland cement, aggregates (fine and coarse), admixtures if desired or required, and water, proportioned and mixed as hereinafter provided.

2. MATERIALS

2.1 CEMENT

The cement shall be either Type I, II or III Portland cement conforming to ASTM Designation: C150, modified as follows:

Unless otherwise specified by the Engineer, the specific surface area of Type I and II cements shall not exceed 2000 square centimeters per gram (Wagner Turbidimeter – TxDOT Test Method Tex-310-D). For concrete piling, the above limit on specific surface area is waived for Type II cement only. The Contractor shall furnish the Engineer, with each shipment, a statement as to the specific surface area of the cement expressed in square centimeters per gram.

For cement strength requirements, either the flexural or compressive test may be used.

Either Type I or II cement shall be used unless Type II is specified on the plans. Except when Type II is specified on the plans, Type III cement may be used when the anticipated air temperature for the succeeding 12 hours will not exceed 60°F. Type III cement may be used in all precast prestressed concrete, except in piling when Type II cement is required for substructure concrete.

Different types of cement may be used in the same structure, but all cement used in any one monolithic placement shall be of the same type and brand. Only one brand of each type will be permitted in any one structure unless otherwise authorized by the Engineer.

Cement may be delivered in bulk where adequate bin storage is provided. All other cement shall be delivered in bags marked plainly with the name of the manufacturer and the type of cement. Similar information shall be provided in the bills of lading accompanying each shipment of packaged or bulk cement. Bags shall contain 94 pounds net. All bags shall be in good condition at time of delivery.

All cement shall be properly protected against dampness. No caked cement will be accepted.

Cement remaining in storage for a prolonged period of time may be retested and rejected if it fails to conform to any of the requirements of these specifications.

2.2 MIXING WATER

Water for use in concrete and for curing shall be free from oils, acids, organic matter or other deleterious substances and shall not contain more than 1000 parts per million of chlorides as CL nor more than 1000 parts per million of sulfates as SO_{4} .

Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be sampled and tested before use in structural concrete.

Tests shall be made in accordance with the "Method of Test for Quality of Water to be Used in Concrete" (AASHTO Method T26), except where such methods are in conflict with provisions of this specification.

2.3 COARSE AGGREGATE

Coarse aggregate shall consist of durable particles of gravel, crushed blast furnace slag, crushed stone, or combinations thereof; free from frozen material or injurious amount of salt, alkali, vegetable matter, or other objectionable material either free or as an adherent coating; and its quality shall be reasonably uniform throughout. It shall not contain more than 0.25 percent by weight of clay lumps, nor more than 1.0 percent by weight of shale, nor more than 5 percent by weight of laminated and/or friable particles when tested in accordance with TxDOT Test Method Tex-413-A. It shall have a wear of not more than 40 percent when tested in accordance with TxDOT Test Method Tex-410-A.

Unless otherwise specified on the plans, coarse aggregate will be subjected to five cycles of the soundness test in accordance with TxDOT Test Method Tex-411-A. The loss shall not be greater than 12 percent when sodium sulfate is used, or 18 percent when magnesium sulfate is used.

Permissible sizes of aggregate shall be governed by Table 4 and Table 1, except that when exposed aggregate surfaces are required, coarse aggregate gradation will be as specified on the plans.

When tested by approved methods, the coarse aggregate, including combinations of aggregates when used, shall conform to the grading requirements shown in Table 1.

	Percent Retained on Each Sieve									
Aggregate <u>Grade No.</u>	Nominal <u>Size</u>	2-½ <u>In.</u>	2 <u>In</u> .	1-½ <u>In.</u>	1 <u>In.</u>	3/4 <u>In.</u>	1/2 <u>In.</u>	3/8 <u>In.</u>	<u>No. 4</u>	<u>No. 8</u>
1	2 in.	0	0 to 20	15 to 50		60 to 80			95 to 100	
2 (467)*	1-½ in.		0	0 to 5		30 to 65		70 to 90	95 to 100	
4 (57)*	1 in.			0	0 to 5		40 to 75		90 to 100	95 to 100
8	3/8 in.						0	0 to 5	35 to 80	90 to 100

TABLE 1 Coarse Aggregate Gradation Chart

*Numbers in parenthesis indicate conformance with ASTM C33.

The aggregate shall be washed. The Loss by Decantation (TxDOT Test Method Tex-406-A) plus the allowable weight of clay lumps, shall not exceed one percent, or the value shown on the plans, whichever is smaller.

2.4 FINE AGGREGATE

Fine aggregate shall consist of clean, hard, durable and uncoated particles of natural or manufactured sand or a combination thereof, with or without a mineral filler. It shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material and it shall not contain more than 0.5 percent by weight of clay lumps. When subjected to the color test for organic impurities (TxDOT Test Method Tex-408-A), it shall not show a color darker than standard.

The fine aggregate shall produce a mortar having a tensile strength equal to or greater than that of Ottawa sand mortar when tested in accordance with TxDOT Test Method Tex-317-D.

Where manufactured sand is used in lieu of natural sand for slab concrete subject to direct traffic, the acid insoluble residue of the fine aggregate shall be not less than 28 percent by weight when tested in accordance with TxDOT Test Method Tex-612-J.

When tested by approved methods, the fine aggregate or combination of aggregates, including mineral filler, shall conform to the grading requirements shown in Table 2.

TABLE 2 Fine Aggregate Gradation Chart

Percent Retained on Each Sieve

<u>Aggregate Grade No.</u>	<u>3/8 In.</u>	<u>No. 4</u>	<u>No. 8</u>	<u>No. 16</u>	<u>No. 30</u>	<u>No. 50</u>	<u>No. 100</u>	<u>No. 200</u>
1	0	0 to 5	0 to 20	15 to 50	35 to 75	70 to 90	90 to 100	97 to 100

- **NOTE 1:** Where manufactured sand is used in lieu of natural sand, the percent retained on the No. 200 sieve shall be 94 to 100.
- **NOTE 2:** Where the sand equivalent value is greater than 85, the retainage on the No. 50 sieve may be 70 to 94 percent.

Fine aggregate will be subjected to the Sand Equivalent Test (TxDOT Test Method Tex-203-F). The sand equivalent shall not be less than 80 nor less than the value shown on the plans, whichever is greater.

For concrete Classes 'A' and 'C', the fineness modulus as defined below for fine aggregates shall be between 2.30 and 3.10.

The fineness modulus will be determined by adding the percentages by weight retained on the following sieves, and dividing by 100; Nos. 4, 8, 16, 30, 50 and 100.

2.5 MINERAL FILLER

Mineral filler shall consist of stone dust, clean crushed sand, or other approved inert material.

2.6 MORTAR (GROUT)

Mortar for repair of concrete shall consist of 1-part cement, 2-parts finely graded sand, and enough water to make the mixture plastic. When required to prevent color difference, white cement shall be added to produce the color required. When required by the Engineer, latex adhesive shall be added to the mortar.

2.7 ADMIXTURES

Calcium Chloride will not be permitted. Unless otherwise noted, air-entraining, retarding and waterreducing admixtures may be used in all concrete and shall conform to the following requirements:

A "water-reducing, retarding admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency and will retard the initial set of the concrete.

A "water-reducing admixture" is defined as a material which, when added to a concrete mixture in the correct quantity, will reduce the quantity of mixing water required to produce concrete of a given consistency.

(a) <u>Retarding and Water-Reducing Admixtures</u>. The admixture shall meet the requirements for Type A and Type D admixture as specified in ASTM Designation: C494, modified as follows:

- (1) The water-reducing retarder shall retard the initial set of the concrete a minimum of 2 hours and a maximum of 4 hours, at a specified dosage rate, at a temperature of 90°F.
- (2) The cement used in any series of tests shall be either the cement proposed for specific work or a "reference" Type I cement from one mill.
- (3) Unless otherwise noted on the plans, the minimum relative durability factor shall be 80.

The air-entraining admixture used in the referenced and test concrete shall be neutralized Vinsol resin.

- (b) <u>Air-Entraining Admixture</u>. The admixture shall meet the requirements of ASTM Designation: C260, modified as follows:
 - (1) The cement used in any series of tests shall be either the cement proposed for specific work or a "reference" Type I cement from one mill.
 - (2) Unless otherwise noted on the plans, the minimum relative durability factor shall be 80.

The air-entraining admixture used in the referenced concrete shall be neutralized Vinsol resin.

3. STORAGE OF CEMENT

All cement shall be stored in well-ventilated weatherproof buildings or approved bins, which will protect it from dampness or absorption of moisture. Storage facilities shall be ample, and each shipment of packaged cement shall be kept separated to provide easy access for identification and inspection.

The Engineer may permit small quantities of sacked cement to be stored in the open for a maximum of 48 hours on a raised platform and under waterproof covering.

4. STORAGE OF AGGREGATE

The method of handling and storing concrete aggregate shall prevent contamination with foreign materials. If the aggregates are stored on the ground, the sites for the stockpiles shall be clear of all vegetation and level. The bottom layer of aggregate shall not be disturbed or used without recleaning.

When conditions require the use of two or more sizes of aggregates, they shall be separated to prevent intermixing. Where space is limited, stockpiles shall be separated by physical barriers.

Methods of handling aggregates during stockpiling and subsequent use shall be such that segregation will be minimized.

Unless otherwise authorized by the Engineer, all aggregate shall be stockpiled at least 24 hours to reduce the free moisture content.

5. MEASUREMENT OF MATERIALS

The measurement of the materials, except water, used in batches of concrete, shall be by weight. The fine aggregate, coarse aggregate and mineral filler shall be weighed separately. Where bulk cement is used, it shall be weighed separately, but batch weighing of sacked cement will not be required. Where sacked cement is used, the quantities of material per batch shall be based upon using full bags of cement. Batches involving the use of fractional bags will not be permitted.

Allowance shall be made for the water content in the aggregates.

Bags of cement varying more than 3 percent from the specified weight of 94 pounds may be rejected, and when the average weight per bag in any shipment, as determined by weighing 50 bags taken at random, is less than the net weight specified, the entire shipment may be rejected. If the shipment is accepted, the Engineer will adjust the concrete mix to a net weight per bag fixed by an average of all individual weights which are less than the average weight determined from the total number weighed.

6. CLASSIFICATION AND MIX DESIGN

It shall be the responsibility of the Contractor to furnish the mix design, using a coarse aggregate factor acceptable to the Engineer, for the class(es) of concrete specified. The mix shall be designed by a qualified concrete technician to conform with the requirements contained herein and in accordance with the THD Bulletin C-11. The Contractor shall perform, at his own expense, the work required to substantiate the design, except the testing of strength specimens, which will be done by the Engineer. Complete concrete design data shall be submitted to the Engineer for approval.

It shall also be the responsibility of the Contractor to determine and measure the batch quantity of each ingredient, including all water, so that the mix conforms to these specifications and any other requirements shown on the plans.

In lieu of the above mix design responsibility, the Contractor may accept a design furnished by the Engineer; however, this will not relieve the Contractor of providing concrete meeting the requirements of these specifications.

Trial batches will be made and tested using all of the proposed ingredients prior to the placing the concrete, and when the aggregate and/or brand of cement or admixture is changed. Trial batches shall be made in the mixer to be used on the job. When transit mix concrete is to be used, the trial designs will be made in a transit mixer representative of the mixers to be used. Batch size shall not be less than 50 percent of the rated mixing capacity of the truck.

Mix designs from previous or concurrent jobs may be used without trial batches if it is shown that no substantial change in any of the proposed ingredients has been made.

The coarse aggregate factor shall not be more than 0.82, except that when the voids in the coarse aggregate exceed 48 percent of the total dry loose volume, the coarse aggregate factor shall not exceed 0.85. The coarse aggregate factor shall not be less than 0.70 for Grades 1, 2 and 3 aggregates.

If the strength required for the class of concrete being produced is not secured with the cement specified in Table 4, the Contractor may use an approved water-reducing or retarding admixture, or he shall furnish aggregates with different characteristics which will produce the required results. Additional cement may be

required or permitted as a temporary measure until the redesign is checked.

Water-reducing or retarding agents may be used with all classes of concrete at the option of the Contractor.

When water-reducing or retarding agents are used at the option of the Contractor, reduced dosage of the admixture will be permitted.

Entrained air will be required in accordance with Table 4. The concrete shall be designed to entrain 5 percent air when Grade 2 coarse aggregate is used and 6 percent when Grade 3 coarse aggregate is used. Concrete as placed in the structure shall contain the proper amount as required above with a tolerance of plus or minus 1.5 percentage points. Occasional variations beyond this tolerance will not be cause for rejection. When the quantity of entrained air is found to be above 7 percent with Grade 2 coarse aggregate or above 8 percent for Grade 3 coarse aggregate, additional test beams or cylinders will be made. If these beams or cylinders pass the minimum flexural or compressive requirements, the concrete will not be rejected because of the variation in air content.

7. CONSISTENCY

In cases where the consistency requirements cannot be satisfied without exceeding the maximum allowable amount of water, the Contractor may use, or the Engineer may require, an approved water-reducing or retarding agent, or the Contractor shall furnish additional aggregates or aggregates with different characteristics, which will produce the required results. Additional cement may be required or permitted as a temporary measure until aggregates are changed and designs checked with the different aggregates or admixture.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by fog spray only, and shall be held to a minimum. The concrete shall be workable, cohesive, possess satisfactory finishing qualities, and of the stiffest consistency that can be placed and vibrated into a homogenous mass. Excessive bleeding shall be avoided. Slump requirements will be as specified in Table 3.

Shua	TABLE 3 an Requirements	
<u>3101</u>	np Requirements	
Concrete Designation	Desired Slump	<u>Max. Slump</u>
Structural Concrete:		
(1) Thin-Walled Sections (9" or less)	4 inches	5 inches
(2) Slabs, Caps, Columns, Piers,		
Wall Sections over 9", etc.	3 inches	4 inches
Underwater or Seal Concrete	5 inches	6 inches
Riprap, Curb, Gutter and Other		
Miscellaneous Concrete	2.5 inches	4 inches

NOTE: No concrete will be permitted with slump in excess of the maximums shown.

8. QUALITY OF CONCRETE

8.1 GENERAL

The concrete shall be uniform and workable. The cement content, maximum allowable water-cement ratio, the desired and maximum slump and the strength requirements of the various classes of concrete shall conform to the requirements of Table 3 and Table 4 and as required herein.

During the process of the work, the Engineer will cast test cylinders or beams as a check on the compressive or flexural strength of the concrete actually placed.

A test shall be defined as the average of the breaking strength of two cylinders or two beams, as the case may be. Specimens will be tested in accordance with TxDOT Test Methods Tex-418-A or Tex-420-A.

Test beams or cylinders will be required as specified in the contract documents. For small placements on structures such as manholes, inlets, culverts, wingwalls, etc., the Engineer may vary the number of tests to a minimum of one for each 25 cubic yards placed over a several day period.

All test specimens, beams or cylinders, representing tests for removal of forms and/or falsework shall be cured using the same methods, and under the same conditions as the concrete represented.

"Design Strength" beams and cylinders shall be cured in accordance with THD Bulletin C-11.

The Contractor shall provide and maintain curing facilities as described in THD Bulletin C-11 for the purpose of curing test specimens. Provision shall be made to maintain the water in the curing tank at temperatures between 70°F and 90°F.

When control of concrete quality is by twenty-eight-day compressive tests, job control will be by seven-day compressive tests which are shown to provide the required twenty-eight-day strength, based on results from trial batches. If the required seven-day strength is not secured with the cement specified in Table 4, changes in the batch design will be made.

	Cla	TABLE 4 asses of Concrete		
Sacks Cement per C.Y. (min.)	Minimum Compressive Strength (f'c) 28-Day(psi)	Min. Beam Strength 7-Day (psi)	Maximum Water-Cement Ratio (gal/sack)	Coarse Aggregate No.
5.0	3000	500***	6.5	2-4-8****
4.5	2500	417	8.0	2-4-8****
6.0	3600	600***	6.0	1-2-4**
6.0	3000	500	7.0	2-4
6.5	4000	570	5.0	2-4
	Sacks Cement per C.Y. (min.) 5.0 4.5 6.0 6.0 6.5	ClaMinimum Compressive Sacks Cement per C.Y. (min.)Minimum Compressive Strength (f'c) 28-Day(psi)5.030004.525006.036006.030006.54000	TABLE 4 Classes of ConcreteMinimum CompressiveMin. Beam Strength (f'c)Sacks Cement per C.Y. (min.)Strength (f'c)5.03000500***4.525004176.03600600***6.030005006.54000570	TABLE 4 Classes of ConcreteMinimum CompressiveMin. Beam Strength 7-Day (psi)Maximum Water-Cement Ratio (gal/sack)5.03000500***6.54.525004178.06.03600600***6.06.130005007.06.540005705.0

*Entrained Air (slabs, piers and bent concrete).

- **Grade 1 Coarse Aggregate may be used in foundation only (except cased drilled shafts).
- ***When Type II Cement is used with Class C Concrete, the 7-day beam break requirement will be 550 psi; with Class A Concrete, the minimum 7-day beam break requirement will be 460 psi.
- ****Permission to use Grade 8 Aggregate must have prior approval of the Engineer.

9. MIXING CONDITIONS

The concrete shall be mixed in quantities required for immediate use. Any concrete which is not in place within the limits outlined in specification Section 038000 "Concrete Structures", Article "Placing Concrete-General", shall not be used. Retamping of concrete will not be permitted.

In threatening weather, which may result in conditions that will adversely affect the quality of the concrete to be placed, the Engineer may order postponement of the work. Where work has been started and changes in weather conditions require protective measures, the Contractor shall furnish adequate shelter to protect the concrete against damage from rainfall, or from freezing temperatures. If necessary to continue operations during rainfall, the Contractor shall also provide protective coverings for the material stockpiles. Aggregate stockpiles need be covered only to the extent necessary to control the moisture conditions in the aggregates to adequately control the consistency of the concrete.

10. MIXING AND MIXING EQUIPMENT

All equipment, tools, and machinery used for hauling materials and performing any part of the work shall be maintained in such condition to insure completion of the work underway without excessive delays for repairs or replacements.

The mixing shall be done in a batch mixer of approved type and size that will produce uniform distribution of the material throughout the mass. Mixers may be either the revolving drum type or the revolving blade type, and shall be capable of producing concrete meeting the requirements of these specifications.

After all the ingredients are assembled in the drum, the mixing shall continue not less than 1 minute for mixers of one cubic yard or less capacity plus 15 seconds for each additional cubic yard or portion thereof.

The mixer shall operate at the speed and capacity designated by the Mixer Manufacturers Bureau of the Associated General Contractors of America. The mixer shall have a plate affixed showing the manufacturer's recommended operating data.

The absolute volume of the concrete batch shall not exceed the rated capacity of the mixer.

The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch.

The first batch of concrete materials placed in the mixer for each placement shall contain an extra quantity of sand, cement and water sufficient to coat the inside surface of the drum.

Upon the cessation of mixing for any considerable length of time, the mixer shall be thoroughly cleaned.

The concrete mixer shall be equipped with an automatic timing device which is put into operation when the skip is raised to its full height and dumping. This device shall lock the discharging mechanism and prevent emptying of the mixer until all the materials have been mixed together for the minimum time required, and

it shall ring a bell after the specified time of mixing has elapsed.

The water tank shall be arranged so that the amount of water can be measured accurately, and when the tank starts to discharge, the inlet supply shall cut off automatically.

Whenever a concrete mixer is not adequate or suitable for the work, it shall be removed from the site upon a written order from the Engineer and a suitable mixer provided by the Contractor.

Pick-up and thro-over blades in the drum of the mixer which are worn down more than 10 percent in depth shall be repaired or replaced with new blades.

Improperly mixed concrete shall not be placed in the structure.

Job mix concrete shall be concrete mixed in an approved batch mixer in accordance with the requirements stated above, adjacent to the structure for which the concrete is being mixed, and moved to the placement site in non-agitating equipment.

11. READY-MIX PLANTS

11.1 GENERAL

It shall be the Contractor's responsibility to furnish concrete meeting all requirement of the governing specification sections, and concrete not meeting the slump, workability and consistency requirements of the governing specification sections shall not be placed in the structure or pavement.

Ready-Mixed Concrete shall be mixed and delivered by means of one of the following approved methods.

- (1) Mixed completely in a stationary mixer and transported to the point of delivery in a truck agitator or a truck mixer operating at truck agitator or truck mixer agitation speed. (Central-Mix Concrete)
- (2) Mixed complete in a truck mixer and transported to the placement site at mixing and/or agitating speed (Transit-Mix Concrete), subject to the following provisions:
 - (a) Truck mixers will be permitted to transport concrete to the job site at mixing speed if equipped with double actuated counters which will separate revolutions at mixing speed from total revolutions.
 - (b) Truck mixers equipped with a single actuated counter counting total revolutions of the drum shall mix the concrete at the plant not less than 50 nor more than 70 revolutions at mixing speed, transport it to the job site at agitating speed and complete the required mixing before placing the concrete.
- (3) Mixed completely in a stationery mixer and transported to the job site in approved non-agitating trucks with special bodies. This method of transporting will be permitted for concrete pavement only.

11.2 EQUIPMENT

(1) Batching Plant

The batching plant shall be provided with adequate bins for batching all aggregates and materials required by the specifications.

Bulk cement shall be weighed on a scale separate from those used for other materials and in a hopper entirely free and independent of that used for weighing the aggregates.

(2) <u>Mixers and Agitators</u>.

(a) <u>General</u>: Mixers shall be of an approved stationary or truck-type capable of combining the ingredients into a thoroughly mixed and uniform mass.

Facilities shall be provided to permit ready access to the inside of the drum for inspection, cleaning and repair of blades.

Mixers and agitators shall be subject to daily examination for changes in condition due to accumulation of hardened concrete and/or wear of blades, and any hardened concrete shall be removed before the mixer will be permitted to be used. Worn blades shall be repaired or replaced with new in accordance with the manufacturer's design and arrangement for that particular unit when any part or section is worn as much as 10 percent below the original height of the manufacturer's design.

- (b) <u>Stationary Mixers</u>: These shall conform to the requirements of Article "Mixing and Mixing Equipment". Truck mixers mounted on a stationary base will not be considered as a stationary mixer.
- (c) <u>Truck Mixers</u>: In addition, truck mixers shall comply with the following requirements:

An engine in satisfactory working condition and capable of accurately gauging the desired speed of rotation shall be mounted as an integral part of the mixing unit for the purpose of rotating the drum. Truck mixers equipped with a transmission that will govern the speed of the drum within the specified revolutions per minute (rpm) will not require a separate engine.

All truck mixers shall be equipped with actuated counters by which the proper number of revolutions of the drum, as specified in Article 11. A. above, may be readily verified. The counters shall be read and recorded at the start of mixing at mixing speeds.

Each until shall have adequate water supply and accurate metering or gauging devices for measuring the amount used.

(d) <u>Agitators</u>: Concrete agitators shall be of the truck type, capable of maintaining a

thoroughly mixed and uniform concrete mass and discharging it within the same degree of uniformity specified for mixers. Agitators shall comply with all of the requirements for truck mixers, except for the actual mixing requirements.

11.3 OPERATION OF PLANT AND EQUIPMENT

Delivery of ready-mixed concrete shall equal or exceed the rate approved by the Engineer for continuous placement. In all cases, the delivery of concrete to the placement site shall assure compliance with the time limits in the applicable specification for depositing successive batches in any monolithic unit. The Contractor shall satisfy the Engineer that adequate standby trucks are available.

A standard ticket system will be used for recording concrete batching, mixing and delivery date.

Tickets will be delivered to the job inspector.

Loads arriving without ticket and/or in unsatisfactory condition shall not be used.

When a stationary mixer is used for the entire mixing operation, the mixing time for one cubic yard of concrete shall be one minute plus 15 seconds for each additional cubic yard or portion thereof. This mixing time shall start when all cement, aggregates and initial water have entered the drum. The mixer shall be charged so that some of the mixing water will enter the drum in advance of the cement and aggregate. All of the mixing water shall be in the drum by the end of the first one-fourth of the specified mixing time. Water used to flush down the blades after charging shall be accurately measured and included in the quantity of mixing water. The introduction of the initial mixing water, except blade wash down water and that permitted in this Article, shall be prior to or simultaneous with the charging of the aggregates and cement.

The loading of truck mixers shall not exceed 63 percent of the total volume of the drum. When used as an agitator only, the loading shall not exceed 80 percent of the drum volume.

When Ready-Mix Concrete is used, additional mortar (one sack cement, three parts sand and sufficient water) shall be added to the batch to coat the drum of the mixer or agitator truck, and this shall be required for every load of Class C concrete only and for the first batch from central mix plants.

A portion of the mixing water, required by the batch design to produce the desired slump, may be withheld and added at the job site, but only with permission of the Engineer and under his supervision. When water is added under the above conditions, it shall be thoroughly mixed as specified below for water added at the job site.

Mixing speed shall be attained as soon as all ingredients are in the mixer, and each complete batch (containing all the required ingredients) shall be mixed not less than 70 nor more than 100 revolutions of the drum at mixing speed except that when water is added at the job site, 25 revolutions (minimum) at mixing speed will be required to uniformly disperse the additional water throughout the mix. Mixing speed shall be as designated by the manufacturer.

All revolutions after the prescribed mixing time shall be at agitating speed. The agitating speed shall be not less than one (1) nor more than five (5) rpm. The drum shall be kept in continuous motion from the time mixing is started until the discharge is completed.

12. PLACING, CURING AND FINISHING

The placing of concrete, including construction of forms and falsework, curing and finishing, shall be in accordance with Standard Specification Section 038000 "Concrete Structures".

13. MEASUREMENT AND PAYMENT

This project is a lump sum bid. The work governed by this specification shall not be measured for pay, but shall be subsidiary to the project.

END OF SECTION

SECTION 032020 REINFORCING STEEL

1. DESCRIPTION

This specification shall govern the furnishing and placing of reinforcing steel, deformed and smooth, of the size and quantity designated on the plans and in accordance with these specifications.

2. MATERIALS

Unless otherwise designated on the plans, all bar reinforcement shall be deformed, and shall conform to ASTM Designation: A615, Grades 40, 60 and 75, and shall be open hearth, basic oxygen, or electric furnace new billet steel.

Large diameter new billet steel (Nos. 14 and 18), Grade 75, will be permitted for straight bars only.

Where bending of bar sizes No. 14 or No. 18 of Grades 40 and 60 is required, bend testing shall be performed on representative specimens as described for smaller bars in the applicable ASTM Specification. The required bend shall be 90 degrees around a pin having a diameter of 10 times the nominal diameter of the bar.

Spiral reinforcement shall be smooth (not deformed) bars or wire of the minimum diameter shown on the plans, and shall be made by one or more of the following processes: open hearth, basic oxygen, or electric furnace. Bars shall be rolled from billets reduced from ingots and shall comply with ASTM Designation: A 306, Grade 65 minimum (references to ASTM Designation: A 29 is voided). Dimensional tolerances shall be in accordance with ASTM Designation: A 615, or ASTM Designation: A 615, Grade 40 or 60, except for deformations. Wire shall be cold-drawn from rods that have been hot-rolled from billets and shall comply with ASTM Designation: A 185.

In cases where the provisions of this specification are in conflict with the provisions of the ASTM Designation to which reference is made, the provisions of this specification shall govern.

Report of chemical analysis showing the percentages of carbon, manganese, phosphorus and sulphur will be required for all reinforcing steel when it is to be welded.

The nominal size and area and the theoretical weight of reinforcing steel bars covered by this specification are as follows:

	Nominal		Weight Per
<u>Bar Size</u>	<u>Diameter,</u>	<u>Nominal Area,</u>	<u>Linear Foot,</u>
<u>Number</u>	<u>ln.</u>	<u>Sq. In.</u>	<u>Pounds</u>
2	0.250	0.05	0.167
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.6
18	2.257	4.00	13.60

Smooth round bars shall be designated by size number through No. 4. Smooth bars above No. 4 shall be designated by diameter in inches.

When wire is ordered by gauge numbers, the following relation between number and diameter, in inches, shall apply unless otherwise specified:

	<u>Equivalent</u>		<u>Equivalent</u>
<u>Gauge</u>	<u>Diameter,</u>	Gauge	<u>Diameter,</u>
<u>Number</u>	Inches	<u>Number</u>	Inches
0	0.3065	8	0.1620
1	0.2830	9	0.1483
2	0.2625	10	0.1350
3	0.2437	11	0.1205
4	0.2253	12	0.1055
5	0.2070	13	0.0915
6	0.1920	14	0.0800
7	0.1770		

3. BENDING

The reinforcement shall be bent cold, true to the shapes indicated on the plans. Bending shall preferably be done in the shop. Irregularities in bending shall be cause for rejection.

Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), shall be as follows:

Bends of 90 degrees and greater in stirrups, ties and other secondary bars that enclose another bar in the bend:

	Grade 40	<u>Grade 60</u>
#3, #4, #5	3d	4d
#6, #7, #8	4d	5d

All bends in main bars and in secondary bars not covered above:

	Grade 40	<u>Grade 60</u>	Grade 75
#3 thru #8	5d	6d	
#9 <i>,</i> #10	5d	8d	
#11	5d	8d	8d
#14, #18	10d	10d	

4. TOLERANCES

Fabricating tolerances for bars shall be within 3 percent of specified.

5. STORING

Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports, and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, paint, grease, oil, or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross-sectional area and tensile properties of a hand wire crushed specimen meets the physical requirements for size and grade of steel specified.

6. SPLICES

No splicing of bars, except when provided on the plans or specified herein, will be permitted without written approval of the Engineer.

Splices not provided for on the plans will be permitted, but not included for measurement, in Grade 40 bars only, sizes No. 8 and smaller, subject to the following:

For bars exceeding 40 feet in plan length, the center-to-center distance of splices shall not be less than 40 feet and no individual bar length shall be less than 10 feet. Splices will not be permitted in bars less than 40 feet in plan length. Splices which are not shown on the plans, but permitted hereby, shall be made in accordance with Table 1 below. The specified concrete cover shall be maintained at such splices and the bars placed in contact and securely tied together.

Splices will not be permitted in main reinforcement at points of maximum stress. When permitted in main bars, splices in adjacent bars will be staggered a minimum of two splice lengths.

	TABLE 1		
	Minimum Lap Requirement		
Lap	Uncoated	<u>Coated</u>	
Lap in inches >	40d	60d	

Where: d = bar diameter in inches

Welding of reinforcing bars may be used only where shown on the plans or as permitted herein. All welding operations, processes, equipment, materials, workmanship and inspection shall conform to the requirements of the plans and to Standard Specification Section 050200 "Welding".

All splices shall be of such dimension and character as to develop the full strength of bar being spliced.

End preparation for butt welding reinforcing bars shall be done in the field. Delivered bars shall be of sufficient length to permit this practice.

For box culvert extensions with less than one foot of fill, the existing longitudinal bars shall have a 20diameter lap with the new bars. For extensions with more than one foot of fill, a minimum of 6 inches lap will be required.

Unless otherwise shown on the plans, dowel bars transferring tensile stresses shall have a minimum embedment equal to the minimum lap requirements shown in Table 1. Shear transfer dowels shall have a minimum embedment of 12 inches.

7. PLACING

Reinforcement shall be placed as near as possible in the position shown on the plans. Unless otherwise shown on the plans, dimensions shown for reinforcement are to the centers of the bars. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than one-twelfth of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars shall not vary from plan placement by more than one-quarter inch. Cover of concrete to the nearest surface of steel shall meet the above requirements but shall never be less than one inch.

Vertical stirrups shall always pass around the main tension members and be attached securely thereto. The

reinforcing steel shall be spaced its required distance from the form surface by means of approved galvanized metal spacers, metal spacers with plastic coated tips, stainless steel spacers, plastic spacers, or approved pre-cast mortar or concrete blocks. For approval of plastic spacers on the project, representative samples of the plastic shall show no visible indications of deterioration after immersion in a 5 percent solution of sodium hydroxide for 120 hours.

All reinforcing steel shall be tied at all intersections, except that where spacing is less than one foot in each direction, alternate intersections only need be tied.

Before any concrete is placed, all mortar shall be cleaned from the reinforcement. Precast mortar or concrete blocks to be used for holding steel in position adjacent to formed surfaces shall be cast in molds meeting the approval of the Engineer and shall be cured by covering with wet burlap or cotton mats for a period of 72 hours.

The blocks shall be cast in the form of a frustum of a cone or pyramid with the smaller face placed against the forms.

A suitable tie wire shall be provided in each block, to be used for anchoring to the steel. Except in unusual cases, and when specifically otherwise authorized by the Engineer, the size of the surface to be placed adjacent to the forms shall not exceed two and one-half inches square or the equivalent thereof in cases where circular or rectangular areas are provided. Blocks shall be cast accurately to the thickness required, and the surface to be placed adjacent to the forms shall be a true plane free of surface imperfections.

Reinforcement shall be supported and tied in such manner that a sufficiently rigid case of steel is provided. If the cage is not adequately supported to resist settlement or floating upward of the steel, overturning of truss bars or movement in any direction during concrete placement, permission to continue concrete placement will be withheld until corrective measures are taken. Sufficient measurements shall be made during concrete placement to ensure compliance with the first paragraph of Article 7 of this specification.

Mats of wire fabric shall overlap each other sufficiently to maintain a uniform strength and shall be fastened securely at the ends and edges.

No concrete shall be deposited until the Engineer has inspected the placement of the reinforcing steel and given permission to proceed.

8. MEASUREMENT

Unless specified otherwise this item shall be measured as a lump sum.

9. PAYMENT

Payment shall be at the lump sum measurement. Payment shall be full compensation for all labor, material, and equipment necessary. To complete the work in accordance with the plans and this specification and shall be subsidiary to the bid item it's listed in.

END OF SECTION

SECTION 033000 CAST-IN-PLACE CONCRETE

1. GENERAL

- 1.1 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
 - 1. Foundations and footings.
 - 2. Slabs-on-grade.
 - 3. Equipment pads and bases.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Portland Cement Concrete Paving" for concrete paving and walks.

1.3 APPLICABLE PUBLICATIONS

- ASTM CI50-81 Standard Specification for Portland Cement
- ASTM C33-82 Standard Specification for Concrete Aggregate
- o ASTM C39-81 Standard Method of Test for Strength of Cylindrical Concrete Specimens
- o ASTM C42-84a Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- ASTM Cl92-81 Standard Method of Making and Curing Concrete Test Specimens in the Laboratory
- o ASTM CI72-82 Standard Method of Sampling Fresh Concrete
- ASTM C143-78 Slump of Portland Cement Concrete
- o ASTM C3I-69 Standard Method of Making and Curing Concrete Test Specimens in the Field
- ASTM C94-81 Standard Specification for Ready Mixed Concrete

- o ASTM C78 Method of Test for Flexural Strength of Concrete
- o ASTM C231-82 Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C260-86 Air Entraining Admixtures for Concrete
- ASTM C494-86 Chemical Admixtures for Concrete

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by the Engineer.
- C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.
- D. Laboratory test reports for concrete materials and mix design test for each class of concrete.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Testing Service: Engage a testing agency acceptable to the Engineer to perform material evaluation tests and to design concrete mixes.
- C. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

2. PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns and Supports: Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches (38 mm) to the plane of the exposed concrete surface.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615 Grade 60, deformed, Grade 40 stirrups and ties.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Flat sheets only.
- D. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs or use Haydite (CMU) blocks.
 - 2. For exposed-to-view concrete surfaces where legs of supports are in contact

with forms, provide supports that are plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout Project unless otherwise acceptable to the Engineer.
- B. Fly Ash: ASTM C 618, Type F.
- C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
- D. Water: Potable.
- E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Air-Tite, Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air, Euclid Chemical Co.
 - c. Darex AEA or Daravair, W.R. Grace & Co.
 - d. MB-VR or Micro-Air, Master Builders, Inc.
 - e. Sealtight AEA, W.R. Meadows, Inc.
 - f. Sika AER, Sika Corp.
- G. Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Chemtard, ChemMasters Corp.
 - b. PSIN, Cormix Construction Chemicals.
 - c. Eucon WR-75, Euclid Chemical Co.
 - d. WRDA, W.R. Grace & Co.
 - e. Pozzolith Normal or Polyheed, Master Builders, Inc.
 - f. Metco W.R., Metalcrete Industries.
 - g. Prokrete-N, Prokrete Industries

- h. Plastocrete 161, Sika Corp.
- H. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Super P, Anti-Hydro Co., me.
 - b. Cormix 200, Cormix Construction Chemicals.
 - c. Eucon 37, Euclid Chemical Co.
 - d. WRDA 19 or Daracem, W.R. Grace & Co.
 - e. Rheobuild or Polyheed, Master Builders, Inc.
 - f. Superslump, Metalcrete Industries.
 - g. PSPL, Prokrete Industries
 - h. Sikament 300, Sika Corp.
- I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Q-Set, Conspec Marketing & Manufacturing Co.
 - b. Lubricon NCA, Cormix Construction Chemicals.
 - c. Accelguard 80, Euclid Chemical Co.
 - d. Daraset, W.R. Grace & Co.
 - e. Pozzutec 20, Master Builders, Inc.
 - f. Accel-Set, Metalcrete Industries.
- J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. PSI-R Plus, Cormix Construction Chemicals.
 - b. Eucon Retarder 75, Euclid Chemical Co.
 - c. Daratard-17, W.R. Grace & Co.
 - d. Pozzolith R, Master Builders, Inc.
 - e. Protard, Prokrete Industries.
 - f. Plastiment, Sika Corporation.

2.4 RELATED MATERIALS

- A. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick (0.76 mm) with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.
- B. Sand Cushion: Clean, manufactured or natural sand.

- C. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:
 - 1. Polyethylene sheet not less than 11 mils thick.
- D. Concrete Sealer/Hardener and Dustproofer.
 - 1. Sonneborn Lapidolith.
- E. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
 - 2. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Highseal, Conspec Marketing and Mfg. Co.
 - b. Sealco VOC, Cormix Construction Chemicals.
 - c. Safe Cure and Seal, Dayton Superior Corp.
 - d. Aqua-Cure, Euclid Chemical Co.
 - e. Dress & Seal WB, L&M Construction Chemicals, Inc.
 - f. Masterkure 100W, Master Builders, Inc.
 - g. Vocomp-20, W.R. Meadows, Inc.
 - h. Metcure, Metalcrete Industries.
 - i. Stontop CS1, Stonhard, Inc.
 - j. Kure-N-Seal WB.
- F. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1 inch (25 mm) thick to feathered edges.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. K-15, Ardex, Inc.
 - b. Self-Leveling Wear Topping, W.R. Bonsai, Co.
 - c. Conflow, Conspec Marketing and Mfg. Co.
 - d. Corlevel, Cormix Construction Chemicals.
 - e. LevelLayer II, Dayton Superior Corp.
 - f. Flo-Top, Euclid Chemical Co.
 - g. Gyp-Crete, Gyp-Crete Corp.
 - h. Levelex, L&M Construction Chemicals, Inc.
 - i. Underlayment 110, Master Builders, Inc.
 - j. Stoncrete UL1, Stonhard, Inc.
 - k. Concrete Top, Symons Corp.
 - 1. Thoro Underlayment Self-Leveling, Thoro System Products.

- G. Bonding Agent: Polyvinyl acetate or acrylic base.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Polyvinyl Acetate (Interior Only):
 - 1. Superior Concrete Bonder, Dayton Superior Corp.
 - 2. Euco Weld, Euclid Chemical Co.
 - 3. Weld-Crete, Larsen Products Corp.
 - 4. Everweld, L&M Construction Chemicals, Inc.
 - 5. Herculox, Metalcrete Industries.
 - 6. Ready Bond, Symons Corp.
 - b. Acrylic or Styrene Butadiene:
 - 1. Acrylic Bondcrete, The Burke Co.
 - 2. Strongbond, Conspec Marketing and Mfg. Co.
 - 3. Day-Chem Ad Bond, Dayton Superior Corp.
 - 4. SBR Latex, Euclid Chemical Co.
 - 5. Daraweld C, W.R. Grace & Co.
 - 6. Hornweld, A.C. Horn, hie.
 - 7. Everbond, L&M Construction Chemicals, Inc.
 - 8. Acryl-Set, Master Builders Inc.
 - 9. Intralok, W.R. Meadows, Inc.
 - 10. Acrylpave, Metalcrete Industries.
 - 11. Sonocrete, Sonneborn-Chemrex.
 - 12. Stonlock LB2, Stonhard, Inc.
 - 13. Strong Bond, Symons Corp.
- H. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
 - 1. Available Products: Subject to compliance with requirements, products that maybe incorporated in the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Burke Epoxy M.V., The Burke Co.
 - b. Spec-Bond 100, Conspec Marketing and Mfg. Co.
 - c. Resi-Bond (J-58), Dayton Superior.
 - d. Euco Epoxy System #452 or #620, Euclid Chemical Co.
 - e. Epoxtite Binder 2390, A.C. Horn, Inc.
 - f. Epabond, L&M Construction Chemicals, Inc.
 - g. Concresive Standard Liquid, Master Builders, Inc.

- h. Rezi-Weld 1000, W.R. Meadows, Inc.
- i. Metco Hi-Mod Epoxy, Metalcrete Industries,
- j. Sikadur 32 Hi-Mod, Sika Corp.
- k. Stonset LV5, Stonhard, Inc.
- 1. R-600 Series, Symons Corp.

2.5 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to the Engineer for preparing and reporting proposed mix designs.
 - 1. Do not use the same testing agency for field quality control testing.
 - 2. Limit use of fly ash to not exceed 15 percent of cement content by weight.
- B. Submit written reports to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by the Engineer.
- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
 - 1. 4000 psi (27.6 MPa), 28-day compressive strength; water-cement ratio, 0.44 maximum (non-airentrained), 0.35 maximum (air-entrained).
 - 2. 3500 psi (24.1 MPa), 28-day compressive strength; water-cement ratio, 0.51 maximum (non-airentrained), 0.40 maximum (air-entrained).
 - 3. 3000 psi (20.7 MPa), 28-day compressive strength; water-cement ratio, 0.58 maximum (non-airentrained), 0.46 maximum (air-entrained).
 - 4. 2500 psi (17.2 MPa), 28-day compressive strength; water-cement ratio, 0.67 maximum (non-airentrained), 0.54 maximum (air-entrained).
- D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows: <u>W/C 0.50.</u>
- E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement. See general notes in structural drawings.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in Work.

2.6 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).
- C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.
- D. Use air entraining admixture in exterior exposed concrete unless otherwise indicated. Add air entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits: 2 to 4 percent air.
- E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85°F (29°C) and 90°F (32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.
 - 2. When air temperature is above 90°F (32°C), ice may be added to the batch in the plant to reduce the rate of hydration with prior approval of the Engineer.
 - 3. No concrete shall be placed when the concrete temperature exceeds 97°F, or when the delivery times are exceeded. Concrete may not be retempered.

3. EXECUTION

- 3.1 GENERAL
 - A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
 - 1. Provide Class A tolerances for concrete surfaces exposed to view.

- 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER/BARRIER INSTALLATION

- A. General: Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour.
- B. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.4 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement

placement and concreting operations. Repair damages before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, place, support and secure reinforcement against displacement. Maintain minimum coverages as indicated for concrete protection.
- D. Provide all necessary accessories in the form of chairs, bolsters, spreaders, spacers, hangers, etc., to adequately secure and hold reinforcement in its proper position during all phases of construction. Set wire ties so ends are directed into concrete, not touching exposed concrete surfaces.
- E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. Construction Joints: Construction joints shall not be located within the depth of any horizontal member or along the length of any column between intersecting horizontal members. All construction joints shall be where indicated on the drawings or as approved by the Engineer.
- B. Provide keyways at least 1-1/2 inches (38 mm) deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."
- F. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth, unless otherwise indicated.
 - 1.Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip
into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on
each side of insert. After concrete has

cured, remove inserts and clean groove of loose debris.

- 2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- 3. If joint pattern is not shown, provide joints not exceeding 15 ft. (4.5 m) in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
- 4. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.6 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
- C. Install dovetail anchor slots in concrete structures as indicated on drawings.
- D. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of apanel or section.
 - 1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 - 3. Maintain reinforcing in proper position during concrete placement.
- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. Hot-Weather Placement: When hot weather conditions exist that would impair

quality and strength of concrete, place concrete complying with ACI 305 and as specified.

- 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90°F (32°C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
- 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
- 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
- 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to the Engineer.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.
 - 1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.
 - 1. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.

- 2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
 - After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTME1155 (ASTME 1155M). Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTME 1155 (ASTME 1155M). Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 - 1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Grind smooth any surface defects that would telegraph through applied floor covering system.

- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with the Engineer before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture- retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:

- 1. Moisture cure all concrete floors scheduled to receive epoxy resin flooring and stained concrete finish.
- 2. Keep concrete surface continuously wet by covering with water.
- 3. Use continuous water-fog spray.
- 4. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch (100 mm) lap over adjacent absorptive covers.
- E. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
 - 1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- F. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
 - 1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.13 SHORES AND SUPPORTS

- A. General: Comply with ACI347 for shoring and reshoring in multistory construction, and as specified.
- B. Extend shoring at least three floors under floor or roof being placed for structures over four stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.
- D. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.14 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, maybe removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.15 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to the Engineer.

3.16 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: After approval of the Engineer, repair and patch defective areas with cement mortar immediately after removing forms.
- B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.
 - Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off
slightly higher than surrounding surface.

- C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with drypack mortar or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
 - 1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
 - 3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to the Engineer.
 - 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch (25 mm) in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- E. Repair isolated random cracks and single holes 1 inch (25 mm) or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry- pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs with prior approval of the Engineer for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above maybe used, subject to acceptance of the Engineer.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by the Engineer.
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40°F (4°C) and below, when 80°F (27°C) and above, and one test for each set of compressive-strength specimens.
 - d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. (4 cu. m) plus additional sets for each 50 cu. yd. (38 cu. m) more than the first 25 cu. yd. (19 cu. m) of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), the Engineer may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

- C. Test results will be reported in writing to the Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

SECTION 038000 CONCRETE STRUCTURES

1. DESCRIPTION

This specification shall govern for construction of all types of structures involving the use of structural concrete, except where the requirements are waived or revised by other governing specifications.

All concrete structures shall be constructed in accordance with the design requirements and details shown on the plans; in conformity with the pertinent provisions of the items contracted for; the incidental specifications referred to; and in conformity with the requirements herein.

2. MATERIALS

(1) <u>Concrete</u>. All concrete shall conform to the provisions of Standard Specification Section 030020, "Portland Cement Concrete".

The class of concrete for each type of structure or unit shall be as specified on the plans or by pertinent governing specifications.

(2) Expansion Joint Material.

(a) <u>Preformed Fiber Material</u>. Preformed fiber expansion joint material shall be of the dimensions shown on the plans. At the Contractor's option, the material shall be one of the following types, unless otherwise noted on the plans:

- 1. <u>Preformed Bituminous Fiber Materials</u> shall meet the requirements of ASTM Designation: D1751 "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)".
- 2. <u>Preformed Non-Bituminous Fiber Material</u> shall meet the requirements of ASTM Designation: D1751 "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)", except that the requirements pertaining to bitumen content, density and water absorption shall be voided.

(b) <u>Joint Sealing Materials</u>. Unless otherwise shown on the plans, joint sealing material shall conform to the following requirements. The material shall adhere to the sides of the concrete joint or crack and shall form an effective seal against infiltration of water and incompressibles. The material shall not crack or break when exposed to low temperatures.

 <u>Class 1-a.</u> (Two-Component, Synthetic Polymer, Cold-Extruded Type). Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles. This type is specifically designed for vertical or sloping joints and hence not self-leveling. It shall cure sufficiently at an average temperature of 77 degrees F ± 3 degrees F in a maximum of 24 hours. For performance requirements see under 2.(2)(b)2. below. <u>Class 1-b.</u> (Two-Component, Synthetic Polymer, Cold-Pourable, Self-Leveling Type). Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles. It shall cure sufficiently at an average temperature of 77 degrees F ± 3 degrees F in a maximum of 3 hours.

<u>Performance Requirements</u>: Class 1-a and Class 1-b joint materials, when tested in accordance with TxDOT Test Method Tex-525-C, shall meet the above curing times and the following requirements:

It shall be of such consistency that it can be mixed and poured, or mixed and extruded into joints at temperatures above 60 degrees F.

Penetration, 77º F.:	
150 gm. cone, 5 sec., max., cm	0.90
Bond and Extension 75%, Oº F, 5 cycles:	
Dry Concrete Blocks	Pass
Wet Concrete Blocks	Pass
Steel Blocks (Primed if specified by manuf.)	Pass
Flow at 200º F	None
Water Content % by weight, max	5.0
Resilience:	
Original sample min. % (cured)	50
Oven aged at 158º F min. %	50
For Class 1-a Material Only:	
Cold Flow (10 min.)	None

(c) <u>Asphalt Board</u>. Asphalt Board shall consist of two liners of 0.016-inch asphalt impregnated paper, filled with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and sufficiently rigid to permit installation. When tested in accordance with TxDOT Test Method Tex-524-C, the asphalt board shall not deflect from the horizontal more than one inch in three and one-half inches (1" in $3\frac{1}{2}$ ").

(d) <u>Rebonded Neoprene Filler</u>. Rebonded neoprene filler shall consist of ground closed-cell neoprene particles, rebonded and molded into sheets of uniform thickness, of the dimensions shown on plans.

Filler material shall have the following physical properties and shall meet the requirements of ASTM Designation: D1752 "Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction", Type 1, where applicable:

PROPERTY	METHOD	REQUIREMENT
Color	ASTM D1752, Type 1	Black
Density	ASTM D1752, Type 1	40 lb./ft ³ Min.
Recovery	ASTM D1752, Type 1	90% Min.
Compression	ASTM D1752, Type 1	50 to 500 psi
Extrusion	ASTM D1752, Type 1	0.25 inch Max.
Tensile Strength	ASTM D1752, Type 1	20 psi Min.
Elongation		75% Min.

The manufacturers shall furnish the Engineer with certified test results as to compliance with the above requirements and a 12 inch x 12 inch x 1 inch sample from the shipment for approval.

(3) <u>Curing Materials</u>.

(a) Membrane curing materials shall comply with ASTM Designation: C309 "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete", Type 1 clear or translucent, or Type 2 white-pigmented. The material shall have a minimum flash-point of 80 degrees F when tested by the "Pensky-Martin Closed Cup Method".

It shall be of such consistency that it can be satisfactorily applied as a fine mist through an atomizing nozzle by means of approved pressure spraying equipment at atmospheric temperatures above 40 degrees F.

It shall be of such nature that it will not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete or its components. Type 1 compound shall contain a fugitive dye that will be distinctly visible not less than 4 hours nor more than 7 days after application. The compound shall produce a firm, continuous, uniform moisture impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface at the rate of coverage specified herein, be dry to the touch in not more than 4 hours, and shall adhere in a tenacious film without running off or appreciable sagging. It shall not disintegrate, check, peel or crack during the required curing period.

The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job only in the manufacturer's original containers, which shall be clearly labeled with the manufacturer's name, the trade name of the material, and a batch number or symbol with which test samples may be correlated.

The water retention test shall be in accordance with TxDOT Test Method Tex-219-F. Percentage loss shall be defined as the water lost after the application of the curing material was applied. The permissible percentage moisture loss (at the rate of coverage specified herein) shall not exceed the following:

24 hours after application......2 percent 72 hours after application......4 percent

Type 1 (Resin Base Only) curing compound will be permitted for slab concrete in bridge decks and top slabs of direct traffic culverts.

(b) Mat curing of concrete is allowed where permitted by Table 1 in this specification or where otherwise approved by the Engineer.

3. EXPANSION JOINTS

Joints and devices to provide for expansion and contraction shall be constructed where and as indicated herein or on the plans.

All open joints and joints to be filled with expansion joint material, shall be constructed using forms adaptable to loosening or early removal. To avoid expansion or contraction damage to the adjacent concrete, these forms shall be loosened as soon as possible after final concrete set to permit free movement without requiring full form removal.

Prior to placing the sealing material, the vertical facing the joint shall be cleaned of all laitance by sandblasting or by mechanical routing. Cracked or spalled edges shall be repaired. The joint shall be blown clean of all foreign material and sealed. Where preformed fiber joint material is used, it shall be anchored to the concrete on one side of the joint by light wire or nails, to prevent the material from falling out. The top one inch (1") of the joint shall be filled with joint sealing material.

Finished joints shall conform to the indicated outline with the concrete sections completely separated by the specified opening or joint material.

Soon after form removal and again where necessary after surface finishing, all projecting concrete shall be removed along exposed edges to secure full effectiveness of the expansion joints.

4. CONSTRUCTION JOINTS

The joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set shall be deemed a construction joint. The term "monolithic placement" shall be interpreted to mean at the manner and sequence of concrete placing shall not create construction joints.

Construction joints shall be of the type and at the locations shown on the plans. Additional joints will not be permitted without written authorization from the Engineer, and when authorized, shall have details equivalent to those shown on the plans for joints in similar locations.

Unless otherwise provided, construction joints shall be square and normal to the forms. Bulkheads shall be provided in the forms for all joints, except when horizontal.

Construction joints requiring the use of joint sealing material shall be as detailed on the plans. The material will be specified on the plans without referenced to joint type.

A concrete placement terminating at a horizontal construction joint shall have the top surface roughened

thoroughly as soon as practicable after initial set is attained. The surfaces at bulkheads shall be roughened as soon as the forms are removed.

The hardened concrete surface shall be thoroughly cleaned of all loose material, laitance, dirt or foreign material, and saturated with water so it is moist when placing fresh concrete against it. Forms shall be drawn tight against the placing of the fresh concrete.

5. FORMS

(1) <u>General</u>. Except where otherwise specified, forms may be of either timber or metal.

Forms for round columns exposed to view shall be of steel, except that other materials will be allowed with written permission of the Engineer.

Forming plans shall be submitted to the Engineer for approval as specified. Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot. The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. For job fabricated forms, an additional live load of 50 pounds per square foot shall be allowed on horizontal surfaces. The maximum unit stresses shall not exceed 125 percent of the allowable stresses used by the Texas Department of Transportation for the design of structures.

Commercially produced structural units used in formwork shall not exceed the manufacturer's maximum allowable working load for moment, shear or end reaction. The maximum working load shall include a live load of 35 pounds per square foot of horizontal form surface, and sufficient details and data shall be submitted for use in checking formwork details for approval.

Forms shall be practically mortar-tight, rigidly braced and strong enough to prevent bulging between supports, and maintained to the proper line and grade during concrete placement. Forms shall be maintained in a manner that will prevent warping and shrinkage.

Offset at form joints shall not exceed one-sixteenth of an inch (1/16").

Deflections due to cast-in-place slab concrete and railing shown in the dead load deflection diagram shall be taken into account in the setting of slab forms.

All forms and footing areas shall be cleaned of any extraneous matter before placing concrete.

Permission to place concrete will not be given until all such work is completed to the satisfaction of the Engineer.

If, at any stage of the work, the forms show signs of bulging or sagging, the portion of the concrete causing such condition shall be removed immediately, if necessary, and the forms shall be reset and securely braced against further movement.

(2) <u>Timber Forms</u>. Lumber for forms shall be properly seasoned, of good quality, and free from imperfections which would affect its strength or impair the finished surface of the concrete. The lumber used for facing or sheathing shall be finished on at least one side and two edges and shall be sized to uniform thickness.

Form lining will be required for all formed surfaces, except for the inside of culvert barrels, inlets and manholes; surfaces that are subsequently covered by backfill material or are completely enclosed; and, any surface formed by a single finished board. Lining will not be required when plywood forms are used.

Form lining shall be of an approved type such as Masonite or plywood. Thin membrane sheeting, such as polyethylene sheets, shall not be used for form lining.

Forms may be constructed of plywood not less than one-half inch in thickness, with no form lining required. The grain of the face plies on plywood forms shall be placed parallel to the span between the supporting studs or joists.

Plywood used for forming surfaces that remain exposed shall be equal to that specified as B-B Plyform Class I or Class II Exterior, of the U. S. Department of Commerce, National Bureau of Standards and Technology, latest edition.

Forms or form lumber to be reused shall be maintained clean and in good condition. Any lumber which is split, warped, bulged, marred, or has defects that will produce inferior work, shall not be used and, if condemned, shall be promptly removed from the work.

Studs and joists shall be spaced so that the facing form material remains in true alignment under the imposed loads.

Wales shall be spaced close enough to hold forms securely to the designated lines and scabbed at least 4 feet on each side of joints to provide continuity. A row of wales shall be placed near the bottom of each placement.

Facing material shall be placed with parallel and square joints and securely fastened to supporting studs.

Forms for surfaces receiving only an ordinary finish and exposed to view shall be placed with the form panels symmetrical, i.e., long dimensions set in the same direction. Horizontal joints shall be continuous.

Molding specified for chamfer strips or other uses shall be made of materials of a grade that will not split when nailed and which can be maintained to a true line without warping. Wood molding shall be mill cut and dressed on all faces. Unless otherwise provided, forms shall be filleted at all sharp corners and edges with triangular chamfer strips measuring three-quarter inch (3/4") on the sides.

Forms for railing and ornamental work shall be constructed to standards equivalent to first-class millwork. All moldings, panel work and bevel strips shall be straight and true with nearly mitered joints designed so the finished work is true, sharp and clean cut.

All forms shall be constructed to permit their removal without marring or damaging the concrete. The forms may be given a slight draft to permit ease of removal.

Metal form ties of an approved type or a satisfactory substitute shall be used to hold forms in place and shall be of a type that permits ease of removal of the metal as hereinafter specified.

All metal appliances used inside of forms for alignment purposes shall be removed to a depth of at least

one-half inch (1/2'') from the concrete surface. They shall be made so the metal may be removed without undue chipping or spalling, and when removed, shall leave a smooth opening in the concrete surface. Burning off of rods, bolts or ties will not be permitted.

Any wire ties used shall be cut back at least one-half inch (1/2'') from the face of the concrete.

Devices holding metal ties in place shall be capable of developing the strength of the tie and adjustable to allow for proper alignment.

Metal and wooden spreaders which are separate from the forms shall be removed entirely as the concrete is being placed.

Adequate clean-out openings shall be proved for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

Prior to placing concrete, the facing of all forms shall be treated with oil or other bond breaking coating of such composition that it will not discolor or otherwise injuriously affect the concrete surface. Care shall be exercised to prevent coating of the reinforcing steel.

(3) <u>Metal Forms</u>. The foregoing requirements for timber forms regarding design, mortar-tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse and wetting shall also apply to metal forms, except that these will not require lining, unless specifically noted on the plans.

The thickness of form metal shall be as required to maintain the true shape without warping or bulging. All bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or line up properly shall not be used. Metal shall be kept free from rust, grease or other foreign materials.

6. PLACING REINFORCEMENT

Reinforcement in concrete structures shall be placed carefully and accurately and rigidly supported as provided in the specification Section 032020 "Reinforcing Steel". Reinforcing steel supports shall not be welded to I-beams or girders.

7. PLACING CONCRETE-GENERAL

The minimum temperature of all concrete at the time of placement shall be not less than 50 degrees F.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for finishing, the required water shall be applied to the surface by fog spray only, and shall be held to a minimum amount. Fog spray for this purpose may be applied with hand operated fogging equipment.

The maximum time interval between the addition of cement to the batch and the placing of concrete in the forms shall not exceed the following:

<u>Air or Concrete</u> <u>Temperature</u>	Maximum Time
Non-Agitated Concrete:	
Above 80 degrees F	15 minutes
Up to 80 degrees F	30 minutes
Agitated Concrete:	
Above 90 degrees F	45 minutes
75 degrees F to 90 degrees F	60 minutes
35 degrees F to 74 degrees F	90 minutes

The use of an approved retarding agent in the concrete will permit the extension of each of the above temperature-time maximums by 30 minutes for direct traffic culverts, and one hour for all other concrete except that the maximum time shall not exceed 30 minutes for non-agitated concrete.

Before starting work, the Contractor shall inform the Engineer fully of the construction methods he proposes to use, the adequacy of which shall be subject to the approval of the Engineer.

The Contractor shall give the Engineer sufficient advance notice before placing concrete in any unit of the structure to permit the inspection of forms, reinforcing steel placement, and other preparations. Concrete shall not be placed in any unit prior to the completion of formwork and placement of reinforcement therein.

Concrete mixing, placing and finishing shall be done during daylight hours, unless adequate provisions are made to light the entire site of all operations.

Concrete placement will not be permitted when impending weather conditions will impair the quality of the finished work. If rainfall should occur after placing operations are started, the Contractor shall provide ample covering to protect the work. In case of drop in temperature, the provisions set forth in Article "Placing Concrete in Cold Weather" of this specification shall be applied.

The placing of concrete shall be regulated so the pressures caused by the plastic concrete shall not exceed the loads used in form design.

The method of handling, placing and consolidation of concrete shall minimize segregation and displacement of the reinforcement, and produce a uniformly dense and compact mass. Concrete shall not have a free fall of more than 5 feet, except in the case of thin walls such as in culverts. Any hardened concrete spatter ahead of the plastic concrete shall be removed.

The method and equipment used to transport concrete to the forms shall be capable of maintaining the rate of placement approved by the Engineer. Concrete may be transported by buckets, chutes, buggies, belt conveyors, pumps or other acceptable methods.

When belt conveyors or pumps are used, sampling for testing will be done at the discharge end. Concrete

transported by conveyors shall be protected from sun and wind, if necessary, to prevent loss of slump and workability. Pipes through which concrete is pumped shall be shaded and/or wrapped with wet burlap, if necessary, to prevent loss of slump and workability. Concrete shall not be transported through aluminum pipes, tubes or other aluminum equipment.

Chutes, troughs, conveyors or pipes shall be arranged and used so that the concrete ingredients will not be separated. When steep slopes are necessary, the chutes shall be equipped with baffle boards or made in short lengths that reverse the direction of movement, or the chute ends shall terminate in vertical downspouts. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in them. All transporting equipment shall be kept clean and free from hardened concrete coatings. Water used for cleaning shall be discharged clear of the concrete.

Each part of the forms shall be filled by depositing concrete as near its final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point and running or working it along the forms will not be allowed.

Concrete shall be deposited in the forms in layers of suitable depth but not more than 36 inches in thickness, unless otherwise directed by the Engineer.

The sequence of successive layers or adjacent portions of concrete shall be such that they can be vibrated into a homogenous mass with the previously placed concrete without a cold joint. Not more than one hour shall elapse between adjacent or successive placements of concrete. Unauthorized construction joints shall be avoided by placing all concrete between the authorized joints in one continuous operation.

An approved retarding agent shall be used to control stress cracks and/or unauthorized cold joints in mass placements where differential settlement and/or setting time may induce stress cracking.

Openings in forms shall be provided, if needed, for the removal of laitance of foreign matter of any kind.

All forms shall be wetted thoroughly before the concrete is placed therein.

All concrete shall be well consolidated and the mortar flushed to the form surfaces by continuous working with immersion type vibrators. Vibrators which operate by attachment to forms or reinforcement will not be permitted, except on steel forms. At least one stand-by vibrator shall be provided for emergency use in addition to those required for placement.

The concrete shall be vibrated immediately after deposit. Prior to the beginning of work, a systematic spacing of the points of vibration shall be established to insure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures, and into the corners and angles of the forms. Immersion type vibrators shall be inserted vertically, at points 18 to 30 inches apart, and slowly withdrawn. The vibrator may be inserted in a sloping or horizontal position in shallow slabs. The entire depth of each lift shall be vibrated, allowing the vibrator to penetrate several inches into the preceding lift. Concrete along construction joints shall be thoroughly consolidated by operating the vibrator along and close to but not against the joint surface. The vibration shall continue until thorough consolidation, and complete embedment of reinforcement and fixtures is produced, but not long enough to cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

Slab concrete shall be mixed in a plant located off the structure. Carting or wheeling concrete batches over completed slabs will not be permitted until they have aged at least four (4) full curing days. If carts are used, timber planking will be required for the remainder of the curing period. Carts shall be equipped with pneumatic tires. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

After concrete has attained its initial set, at least one (1) curing day shall elapse before placing strain on projecting reinforcement to prevent damage to the concrete.

The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and, when permitted, shall be limited to quantities and distribution that will not induce excessive stresses.

8. PLACING CONCRETE IN COLD WEATHER

(1) <u>Cast-in-Place Concrete</u>. Concrete may be placed when the atmospheric temperature is not less than 35 degrees F. Concrete shall not be placed in contact with any material coated with frost or having a temperature less than 32 degrees F.

Aggregates shall be free from ice, frost and frozen lumps. When required, in order to produce the minimum specified concrete temperature, the aggregate and/or the water shall be heated uniformly, in accordance with the following:

The water temperature shall not exceed 180 degrees F, and/or the aggregate temperature shall not exceed 150 degrees F. The heating apparatus shall heat the mass of aggregate uniformly. The temperature of the mixture of aggregates and water shall be between 50 degrees F and 85 degrees F before introduction of the cement.

All concrete shall be effectively protected as follows:

(a) The temperature of slab concrete of all unformed surfaces shall be maintained at 50 degrees F or above for a period of 72 hours from time of placement and above 40 degrees F for an additional 72 hours.

(b) The temperature at the surface of all concrete in piers, culverts walls, retaining walls, parapets, wingwalls, bottoms of slabs, and other similar formed concrete shall be maintained at 40 degrees F or above for a period of 72 hours from time of placement.

(c) The temperature of all concrete, including the bottom slabs of culverts placed on or in the ground, shall be maintained above 32 degrees F for a period of 72 hours from time of placement.

Protection shall consist of providing additional covering, insulated forms or other means, and if necessary, supplementing such covering with artificial heating. Curing as specified under Article "Curing Concrete" of this specification shall be provided during this period until all requirements for curing have been satisfied.

When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand ready for use before permission is granted to

begin placement.

Sufficient extra test specimens will be made and cured with the placement to ascertain the condition of the concrete as placed, prior to form removal and acceptance.

(2) <u>Precast Concrete</u>. A fabricating plant for precast products which has adequate protection from cold weather in the form of permanent or portable framework and covering, which protects the concrete when placed in the forms, and is equipped with approved steam curing facilities, may place concrete under any low temperature conditions provided:

(a) The framework and covering are placed and heat is provided for the concrete and the forms within one hour after the concrete is placed. This shall not be construed to be one hour after the last concrete is placed, but that no concrete shall remain unprotected longer than one hour.

(b) Steam heat shall keep the air surrounding the concrete between 50 degrees F and 85 degrees F for a minimum of three hours prior to beginning the temperature rise which is required for steam curing.

(c) For fabricating plants without the above facilities and for job site precast products, the requirements of the Article "Curing Concrete" of this specification shall apply.

The Contractor is responsible for the protection of concrete placed under any and all weather conditions. Permission given by the Engineer for placing concrete during freezing weather will in no way relieve the Contractor of the responsibility for producing concrete equal in quality to that placed under normal conditions. Should concrete placed under such conditions prove unsatisfactory, it shall be removed and replaced at no additional cost.

9. PLACING CONCRETE IN WATER

Concrete shall be deposited in water only when specified on the plans or with written permission by the Engineer. The forms or cofferdams shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping will not be permitted during the concrete placing, nor until it has set for at least 36 hours.

The concrete shall be placed with a tremie, closed bottom-dump bucket, or other approved method, and shall not be permitted to fall freely through the water nor shall it be disturbed after it has been placed. The concrete surface shall be kept approximately level during placement.

The tremie shall consist of a water-tight tube 14 inches or less in diameter. It shall be constructed so that the bottom can be sealed and opened after it is in place and fully charged with concrete. It shall be supported so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow.

Bottom-dump buckets used for underwater placing shall have a capacity of not less than one-half cubic yard. It shall be lowered gradually and carefully until it rests upon the concrete already placed and raised very slowly during the upward travel; the intent being to maintain still water at the point of discharge and to avoid agitating the mixture.

The placing operations shall be continuous until the work is complete.

10. PLACING CONCRETE IN BOX CULVERTS

In general, construction joints will be permitted only where shown on the plans.

Where the top slab and walls are placed monolithically in culverts more than 4 feet in clear height, an interval of not less than one (1) nor more than two (2) hours shall elapse before placing the top slab to allow for shrinkage in the wall concrete.

The base slab shall be finished accurately at the proper time to provide a smooth uniform surface. Top slabs which carry direct traffic shall be finished as specified for roadway slabs in Article "Finish of Roadway Slabs". Top slabs of fill type culverts shall be given a reasonably smooth float finish.

11. PLACING CONCRETE IN FOUNDATIONS AND SUBSTRUCTURE

Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the Engineer and permission has been given to proceed.

Placing of concrete footings upon seal concrete courses will be permitted after the caissons or cofferdams are free from water and the seal concrete course cleaned. Any necessary pumping or bailing during the concreting operation shall be done from a suitable sump located outside the forms.

All temporary wales or braces inside cofferdams or caissons shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints in footings or shafts.

When footings can be placed in a dry excavation without the use of cofferdams or caissons, forms may be omitted, if desired by the Contractor and approved by the Engineer, and the entire excavation filled with concrete to the elevation of the top of footing; in which case, measurement for payment will be based on the footing dimensions shown on the plans.

12. TREATMENT AND FINISHING OF HORIZONTAL SURFACES EXCEPT ROADWAY SLABS

All unformed upper surfaces shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification will not be permitted.

After the concrete has been struck off, the surface shall be floated with a suitable float. Sidewalks shall be given a wood float or broom finish, or may be striped with a brush, as specified by the Engineer. Other surfaces shall be wood float finished and striped with a fine brush leaving a fine-grained texture.

13. FINISH OF ROADWAY SLABS

As soon as the concrete has been placed and vibrated in a section of sufficient width to permit working, the surface shall be approximately leveled, struck off and screeded, carrying a slight excess of concrete ahead of the screed to insure filling of all low spots. The screed shall be designed rigid enough to hold true to shape and shall have sufficient adjustments to provide for the required camber. A vibrating screed may be used if heavy enough to prevent undue distortion. The screeds shall be provided with a metal edge.

Longitudinal screeds shall be moved across the concrete with a saw-like motion while their ends rest on headers or templates set true to the roadway grade or on the adjacent finished slab.

The surface of the concrete shall be screeded a sufficient number of times and at such intervals to produce a uniform surface, true to grade and free of voids.

If necessary, the screeded surface shall be worked to smooth finish with a long handled wood or metal float of the proper size, or hand floated from bridges over the slab.

When required by the Engineer, the Contractor shall perform sufficient checks with a long handled 10-foot straightedge on the plastic concrete to insure that the final surface will be within the tolerances specified below. The check shall be made with the straightedge parallel to the centerline. Each pass thereof shall lap half of the preceding pass. All high spots shall be removed and all depressions over one-sixteenth inch (1/16'') in depth shall be filled with fresh concrete and floated. The checking and floating shall be continued until the surface is true to grade and free of depressions, high spots, voids or rough spots.

Rail support holes shall be filled with concrete and finished to match the top of the slab.

A broom finish shall be applied with longitudinal screeding. A broom or burlap drag finish shall be applied with transverse screeding.

Unless otherwise specified, the burlap drag shall consist of four or more layers of 10-ounce burlap fabric, free of seams, dirt or hardened concrete. It shall be kept wet when in use and it shall be drawn over the surface in as many passes as required to produce the desired texture depth. Broom finishes shall be applied with stiff bristled brooms. The Contractor shall have on hand, at all times, brooms for the purpose of providing the desired texture depth when surface conditions are such that the burlap drag will not provide it.

Upon completion of the floating and/or straight edging and before the disappearance of the moisture sheen, the surface shall be given a broom or burlap drag finish. The grooves of these finishes shall be parallel to the structure centerline. It is the intent that the average texture depth resulting from the number of tests directed by the Engineer be not less than 0.035 inch with a minimum texture depth of 0.030 inch for any one test when tested in accordance with TxDOT Test Method Tex-436-A. Should the texture depth fall below that intended, the finishing procedures shall be revised to produce the desired texture.

After the concrete has attained its final set, the roadway surface shall be tested with a standard 10-foot straightedge. The straightedge shall be placed parallel to the centerline of roadway to bridge any depressions and touch high spots. Ordinates of irregularities measured from the face of the straightedge to the surface of the slab shall not exceed one-eighth of an inch (1/8''), making proper allowances for camber, vertical curvature and surface texture. Occasional variations, not exceeding three-sixteenth of an inch (3/16'') will be acceptable, if in the opinion of the Engineer it will not affect the riding qualities.

When directed by the Engineer, irregularities exceeding the above requirements shall be corrected.

In all roadway slab finishing operations, camber for specified vertical curvature and transverse slopes shall be provided.

14. CURING CONCRETE

The Contractor shall inform the Engineer fully of the methods and procedures proposed for curing; shall provide the proper equipment and material in adequate amounts; and shall have the proposed methods, equipment and material approved prior to placing concrete.

Inadequate curing and/or facilities, therefore, shall be cause for the Engineer to stop all construction on the job until remedial action is taken.

All concrete shall be cured for a period of four (4) curing days except as noted herein.

EXCEPTIONS TO 4-DAY CURING

Description	Required Curing
Upper Surfaces of Bridge Slabs and Top Slabs of Direct Traffic Culverts	8 curing days (Type I or III) cement 10 curing days (Type II cement)
Concrete Piling (non-prestressed)	6 curing days

When the air temperature is expected to drop below 35 degrees F, the water curing mats shall be covered with polyethylene sheeting, burlap-polyethylene blankets or other material to provide the protection required by Article "Placing Concrete in Cold Weather" of these specifications.

A curing day is defined as a calendar day when the temperature, taken in the shade away from artificial heat, is above 50 degrees F for at least 19 hours (colder days if satisfactory provisions are made to maintain the temperature of all surfaces of the concrete above 40 degrees F for the entire 24 hours). The required curing period shall begin when all concrete therein has attained its initial set.

The following methods are permitted for curing concrete subject to the restrictions of Table 1 and the following requirements for each method of curing.

(1) <u>Form Curing</u>. When forms are left in contact with the concrete, other curing methods will not be required except for cold weather protection.

(2) <u>Water Curing</u>. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet the requirements for concrete mixing water as specified in the specification Section 030020 "Portland Cement Concrete". Seawater will not be permitted. Water which stains or leaves an unsightly residue shall not be used.

(a) <u>Wet Mat</u>. Cotton mats shall be used for this curing method. They shall be placed as soon as possible after the surface has sufficiently hardened to prevent damage to the concrete. (See Article, "Placing Concrete" of this specification.) Damp burlap blankets made from nine-ounce stock may be placed on the damp concrete surface for temporary protection prior to the application of the cotton mats which may be placed dry and wetted down after placement.

The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces which cannot be cured by contact shall be enclosed with mats and anchored positively to the forms or to the ground so that outside air cannot enter the enclosure. moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.

(b) <u>Water Spray</u>. This curing method shall consist of overlapping sprays or sprinklers that keep all unformed surfaces continuously wet.

(c) <u>Ponding</u>. This curing method requires the covering of the surfaces with a minimum of two inches (2") of clean granular material, kept wet at all times, or a minimum of one-inch (1") depth of water. Satisfactory provisions shall be made to provide a dam to retain the water or saturated granular material.

(3) <u>Membrane Curing</u>. This consists of curing concrete pavement, concrete pavement (base), curbs, gutters, retards, sidewalks, driveways, medians, islands, concrete riprap, cement-stabilized riprap, concrete structures and other concrete as indicated on the plans by impervious membrane method.

Unless otherwise provided herein or shown on the plans, either Type 1-D or Type 2 membrane curing compound may be used where permitted except that Type 1-D (Resin Base Only) will be required for slab concrete in bridge decks and top slabs of direct traffic culverts.

		Т	ABLE 1							
REQUIRED					PERMITTED					
STRUSCTURE UNIT DESCRIPTION	WATER FOR <u>CURIN</u>	<u>G</u> MEI <u>INTI</u>	MBRANE FOR		WATE	R FOR <u>CU</u>	IRING	ME INT	imbran <u>Erim C</u>	NE FOR URING
1. Top slabs of direct traffic culverts	Х		Х							
2. Top surface of any concrete unit upon which concrete is to be placed	n									
and bonded at later										
interval (Stub walls, riser etc.). Other	s, X									
Superstructure concrete	s									
etc.)	з,									
3. Concrete pavement (base), curbs, gutters										
retards, sidewalks,										
driveways, medians, islands, concrete						Х*			Х*	
structures, concrete										
riprap, etc. 4. All substructure										
concrete, culverts, box sewers, inlets, manholes retaining walls	,					Х*			Х*	
*Polyethylene sheeting	g, burlap-polyethylene	mats or	laminated	mats	to	prevent	outside	air	from	entering

will be considered equivalent to water or membrane curing for items 3 and 4.

Membrane curing shall not be applied to dry surfaces, but shall be applied just after free moisture has disappeared. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane.

When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane which is damaged shall be corrected immediately by reapplication of membrane. Unless otherwise noted herein or on the plans, the choice of membrane type shall be at the option of the Contractor. Only one type of curing compound will be permitted on any one structure.

The membrane curing compound shall be applied after the surface finishing has been completed, and immediately after the free surface moisture has disappeared. The surface shall be sealed with a single uniform coating of curing compound applied at the rate of coverage recommended by the manufacturer and directed by the Engineer, but not less than 1 gallon per 180 square feet of area. The Contractor shall provide satisfactory means and facilities to properly control and check the rate of application of the compound.

The compound shall be thoroughly agitated during its use and shall be applied by means of approved mechanical power pressure sprayers. The sprayers used to apply the membrane to concrete pavement or concrete pavement (base) shall travel at uniform speed along the forms and be mechanically driven. The equipment shall be of such design that it will insure uniform and even application of the membrane material. The sprayers shall be equipped with satisfactory atomizing nozzles. Only on small miscellaneous items will the Contractor be permitted to use hand-powered spray equipment. For all spraying equipment, the Contractor shall provide facilities to prevent the loss of the compound between the nozzle and the concrete surface during the spraying operations.

The compounds shall not be applied to a dry surface. If the surface of the concrete has become dry, it shall be moistened prior to application of membrane by fogging or mist application. Sprinkling or coarse spraying will not be allowed.

At locations where the coating shows discontinuities, pinholes or other defects, or if rain falls on the newly-coated surface before the film has dried sufficiently to resist damage, an additional coat of the compound shall be applied immediately at the same rate of coverage specified herein.

To insure proper coverage, the Engineer shall inspect all treated areas after application of the compound for the period of time designated in the governing specification for curing, either for membrane curing or for other methods. Should the foregoing indicate that any area during the curing period is not protected, an additional coat or coats of the compound shall be applied immediately, and the rate of application of the membrane compound shall be increased until all areas are uniformly covered.

When temperatures are such as to warrant protection against freezing, curing by this method shall be supplemented with an approved insulating material capable of protecting the concrete for the specified curing period.

If at any time there is reason to believe that this method of curing is unsatisfactory or is detrimental to the work, the Contractor, when notified, shall immediately cease the use of this method and shall change to curing by one of the other methods specified under this contract.

15. REMOVAL OF FORMS

Except as herein provided, forms for vertical surfaces may be removed when the concrete has aged not less than one day (24 hours) when Type I and Type II cement is used, and not less than one-half day (12 hours) when Type III cement is used, provided it can be done without damage to the concrete.

Forms for inside curb faces may be removed in approximately three hours provided it can be done without damage to the curb.

16. FINISHING EXPOSED SURFACES

Concrete shall be finished as required in the specification Section for the respective item or as otherwise specified on the plans.

An ordinary surface finish shall be applied to all concrete surfaces either as a final finish or preparatory to a higher finish.

Ordinary Surface Finish shall be as follows:

1. After form removal, all porous or honey-combed areas and spalled areas shall be corrected by chipping away all loose or broken material to sound concrete.

2. Feather edges shall be eliminated by cutting a face perpendicular to the surface. Shallow cavities shall be repaired using adhesive grout or epoxy grout. If judged repairable by the Engineer, large defective areas shall be corrected using concrete or other material approved by the Engineer.

3. Holes and spalls caused by removal of metal ties, etc., shall be cleaned and filled with adhesive grout or epoxy grout. Exposed parts of metal chairs on surfaces to be finished by rubbing, shall be chipped out to a depth of one-half inch (1/2") and the surface repaired.

4. All fins, runs, drips or mortar shall be removed from surfaces which remain exposed. Form marks and chamfer edges shall be smoothed by grinding and/or dry rubbing.

5. Grease, oil, dirt, curing compound, etc., shall be removed from surfaces requiring a higher grade of finish. Discolorations resulting from spillage or splashing of asphalt, paint or other similar material shall be removed.

6. Repairs shall be dense, well bonded and properly cured, and when made on surfaces which remain exposed and do not require a higher finish, shall be finished to blend with the surrounding concrete.

17. MEASUREMENT AND PAYMENT

The work governed by this specification shall be measured for pay as specified in the Bid Documents.

END OF SECTION

SECTION 050200 WELDING

1. DESCRIPTION

This specification shall govern for the field welding of structural steel and reinforcing steel.

Provisions are made herein for the welding of the types of steel listed in Table 1, using the manual shielded metalarc process, semi-automatic (manual) gas metal-arc welding and flux cored arc welding processes. Other welding processes may be permitted with the specific approval of the Engineer and with qualification of the welding procedure.

2. STRUCTURAL STEEL GENERAL

Final welds including tack welds to be incorporated therein shall be by a certified welder. Certification being previously certified by tests as prescribed in the "Code for Welding in Building Construction," ASW D1.0-69, of the American Welding Society to perform the type of work required. Miscellaneous welds may be made by a qualified welder, qualified welder being an experienced welder who is capable of making good welds of sound quality, but does not have certification papers. Miscellaneous welds being, welds that have no load carrying capacity in the completed structure. Tack welds shall be cleaned and fused thoroughly with the final weld. Defective, cracked or broken tack welds shall be removed.

Welds shall be as required by the contract or erection drawings. The location or size shall not be changed without approval of the Engineer.

The welder shall place his identification mark with crayon or paint near the groove welds made by him.

No welding will be allowed when the air temperature is lower than 20°F, when surfaces are wet or exposed to rain, snow, or wind, or when operators are exposed to inclement conditions that will hamper good workmanship.

Any moisture present at the point of welding shall be driven off by heat before welding commences. Wind breaks shall be required for the protection of all welding operations.

There shall be no temporary welds for transportation, erection or other purpose on main members, except at locations more than one-sixth the depth of the web from the flanges of beams and girders, as approved by the Engineer.

On A514 steel, all grove welds in main members and in flanges of beams and girders subject to tensile stress or reversals of stress shall be finished smooth and flush on all surfaces, including edges, by grinding in the direction of applied stress, leaving the surfaces free from depressions. Chipping may be used provided it is followed by such grinding. Parts joined by groove welds connecting plates of unequal thickness or width shall have a smooth transition between offset surfaces at a slope not greater than one in four with the surface of either part. The surfaces shall be ground so that the radii at the points of transition will be 4 inches minimum.

All groove welds, except when produced with the aid of backing, shall have the root of the initial weld gouged, chipped or otherwise removed to sound metal before welding is started from the second side, except that back gouding will not be required when welding steel piling or armor joints with E 6010 electrodes. The back side shall be thoroughly cleaned before placing back-up pass.

When backing for welds is left in place to become a part of the structure, it shall be a single length insofar as possible. Where more than a single length is needed, they shall be jointed by full penetration butt welds. The surfaces of this butt weld shall be ground flush as necessary to obtain proper fit-up in the weld joint.

Before welding over previously deposited metal, all slag shall be removed, and the weld and adjacent base metal shall be cleaned. This requirement shall apply equally to successive layers, successive beads and the crater area.

Arc strikes outside the area of permanent welds must be avoided on all steels. Where they do occur, resulting cracks and blemishes shall be ground out to a smooth contour and checked to insure soundness.

Stringer bead technique shall be used where possible for groove welds on all types of steel. Weaving will not be permitted for A514 steel except in welding vertically upward, when a weave not exceeding two electrode diameters is permissible for manual shielded metal-arc welding.

In all welding processes, the progression for all passes in vertical welding shall be upward using a back step sequence.

Groove welds shall begin and terminate at the ends of a joint on extension bars. Edge preparation and thickness of extension bars shall be the same as that of the member being welding and shall extend a minimum of three-fourths inch beyond the joint. Extension bars shall be removed with a cutting torch upon completion and cooling of the weld, and the flange edges shall be smooth.

Any defects exposed by the grinding shall be cleaned, filled with weld metal, and reground to a uniform finish. All grinding shall be parallel to the flange. Excess grinding of the parent metal shall be avoided.

3. FILLER METAL

Electrodes for manual shielded metal-arch welding shall conform to the requirements of the latest edition of "Specifications for Mild Steel Covered Arc-Welding Electrodes", AWS A5.1, or to the requirements of the latest edition of "Specification for Low Alloy Steel Covered Arch-Welding Electrodes," AWS A5.5.

All electrodes and combination of electrode and shielding for gas metal-arc welding for producing weld metal with a minimum specified yield point not exceeding 60,000 psi shall conform to the requirements in the latest edition, "Specification for Mild Steel Electrodes for Gas Metal-Arc Welding," AWS A5.18, or "Specification for Mild Steel Electrodes for Flux Cored Arc Welding," AWS A5.20, applicable for the classifications producing weld metal having a minimum impact strength of 20 ft. -Ib., Charpy V-notch, at a temperature of 0°F or below.

For weld metal with a minimum specified yield strength exceeding 60,000 psi, the Contractor shall demonstrate that each electrode and flux or combination of electrode and shielding medium proposed for use will produce low alloy weld metal having the mechanical properties listed in Table A.

The mechanical properties shall be determined from a multiple pass weld made in accordance with the test requirements of the latest edition of AWS A5.18 or AWS A5.20 as applicable.

TABLE A

Required Mechanical Properties

GMAW Grade	FCAW Grade	Tensile Strength psi - Min	Yield Strength psi - Min	Elongation, % in 2 inches Min	Impact Strength ft-Ib @ OF-Min
E80S	E80T	80,000	65,000	18	20
E90S	E90T	90,000	78,000	17	20
E100S	E100T	100,000	90,000	16	20
E110S	E110T	110,000	98,000	15	20

The mechanical property tests for Grades E110S, E110S, E100T and E110T shall be made using ASTM A 514 base material.

Class of electrode required will be as shown in Table A. Electrodes shall be used with the type of current, the polarity and in the positions permitted by AWS A5.1 and A5.5 for manual shielded metal-arc welding. AWS A5.18 and A5.20 Specifications shall govern for gas metal-arc welding and flux cored arc welding.

TABLE 1
CLASSIFICATION OF ELECTRODES PERMITTED

Type of Steel		Main Members Groove & Fillet Welds			Secondary Members Groove & Fillet Welds	
Steel Piling	FC010		FCOT 0	FCOVY		F705 C
	E6010		E001-8	EGUXX		E705-6
	E6011		E/0D-1B	E/UXX		E/0U-1
A53 Pipe, A500	E7015		E70S-2	E70S-1B		E60T-8
A501	E7016		E70S-3	E70S-2		
	E7018		E70S-6	E70S-3		
Armor Joints			E-70U-1			
A36	E7015		E703-1B	E7015		E70S-1B
A441	E7016		E70S-2	E7016		E70S-2
A572-Grades						
42	E7018		E70S-3	E7018		E70S-3
thru 50	E70U-1		E70S-6	E70T-1		E70S-6
A588	E70T-5		E70S-6	E70T-5		E70U-1
A242(Deck Plates)				E70T-6		
API						
A514		E11018M			E11018M	
	E110S		E110T	E110S		E110T
Reinforcing						
Steel	E7015		E7016	E7018		
A572 Grades 60 and 65						
for Light Towers	E8015		E8016	E8018 (Grades E80S or E80T	

Welding

- 1. Use of the same type electrode with the next higher mechanical properties, in accordance with AWS A5.1 or A5.5, than those listed will be permitted.
- 2. In joint involving base metals of difference yield points or strengths, low hydrogen electrodes applicable to the lower strength base metal may be used.

Before use, all electrodes with low hydrogen coverings conforming to AWS A5.1 shall be dried for not less than two hours between 450° and 500°F and electrodes with low hydrogen coverings conforming to AWS A5.5 for not less than one hour at a temperature between 700° and 800°F. Immediately after drying, electrodes shall be stored in ovens held at a temperature of at least 250°F. E70 electrodes not used within four hours, E80 within two hours and E110 within one-half hour after removal from the storage oven shall be redried before use. Electrodes which have been wet or with cracked or otherwise damaged flux shall not be used. When used for welding A514 steel, electrodes shall be dried at least one hour at temperatures between 700° and 800°F before being used. Electrodes shall be redried only once.

Suitable facilities for drying and storage of electrodes shall be furnished at the job site, along with thermometers for checking and controlling the oven temperature.

In humid atmospheres, the times allowed for use without redrying may be reduced.

When gas or gas mixture is used for gas metal-arc or flux cored arc welding, it shall be of a welding grade having a dew point of -40°F or lower. The gas manufacturer shall furnish certification to the Engineer that the gas or gas mixture is suitable for the intended application and will meet the dew point requirements.

Welding wire coils removed from the original package, shall be protected or stored to keep their characteristics or welding properties intact. Rusty coils, or portions of coils that are rusty shall not be used.

3. Preheat

Preheat ahead of welding both groove and fillet welds (including tack welding) will be required as shown in Table 2. Any moisture present at the point of welding shall be driven off by preheating before welding begins. When the base metal is below the required temperature, it shall be preheated so the parts being welded are not less than the specified temperature within 3 inches of the point of welding.

Preheat and interpass temperatures must be sufficient to prevent crack formation. The preheat temperatures shown are minimum and higher preheats may be necessary in highly restrained welds.

Preheating equipment shall be adequate to maintain the entire joint at or above the specified temperature. When possible, a joint shall be completely welded before it is allowed to cool below the specified temperature but shall always be welded sufficiently to prevent cracking before cooling is permitted.

Usually preheat and interpass temperatures shall not exceed 400°F for thickness up to 1 1/2 inches and 450°F for greater thickness. These temperatures shall never be exceeded on A514 steel.

The welder shall have and use approved equipment for checking preheat and interpass temperatures at all times while welding is in progress.

For all groove welds, preheat temperature shall be measured on the side opposite to which the heat is applied at points about three inches away from the joint.

TABLE 2

MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR MANUAL SHIELDED METAL-ARC WELDING, FLUX CORED ARC WELDING OR GAS METAL-ARC WELDING

MANUAL OR SEMI-AUTOMATIC GAS METAL-ARC WELDING, FLUX CORED ARC WELDING OR MANUAL SHIELDED METAL-ARCH WELDING

Thickness of			
Thickness Part	With Low Hydrogen Electrodes		
at Point of			
Welding			
	ASTM A 36: A 242; A 441		
	A 572 Grades 42,	ASTM A 514	
	45, and 50; A 588		
To 3/4, inch	50F	50F	
Over 3/4 to 1 1/2, inch	70F	125F	
Over 1 1/2 to 2 1/2, inch	150F	175F	
Over 2 ½	225F	225F	

- 1. These temperatures are the minimum required for the thinner material shown for each increment and higher preheat on a step basis will be required for the thicker material within each increment. Preheat and interpass temperatures must be sufficient to prevent crack formation. Temperature above those shown may be required for highly restrained welds.
- 2. When E7010 electrodes are permitted for tacking or temporary root pass, the material shall be preheated to 400°F.
- 3. When joining steels of different strengths or thickness with groove welds, the preheat and interpass temperature for the higher strength steel and the average plat thickness shall be used. For fillet welds, the preheat shall be used for the higher strength steel and the thickest plate being welded.
- 4. When the base metal temperature is below 32°F preheat to at least 70°F and maintain this minimum temperature during welding.
- 5. Heat input when welding A514 steel shall not exceed the steel producers' recommendations.

4. QUALITY OF WELDS

Weld metal shall be sound throughout.

There shall be no cracks in any weld or weld pass.

There shall be complete fusion between the weld metal and the base metal and between successive passes throughout the joint.

Welding

Welds shall be free from overlap and the base metal free from undercut more than one one-hundredth inch deep when its direction is transverse to the primary stress in the part that is undercut. Undercut shall not be more than one thirty-second inch deep when its direction is parallel to the primary stress in the part that is undercut.

All craters shall be filled to the full cross section of the welds.

All welds on A514 steel shall be visually examined for longitudinal or transverse cracks not less than 48 hours after completion of the welding.

5. CORRECTIONS

When welding is unsatisfactory or indicates inferior workmanship, the following corrective measures will be required by the Engineer whose specific approval shall be obtained for making each correction.

When requirements prescribe the removal of part of the weld or a portion of the base metal, removal shall be by oxygen gouging or arc-air gouging.

Oxygen gouging shall not be used on A514 steel. All surfaces shall be ground after arc-air gouging.

Backgouging of splices in beams and girders or cutouts of defective welds shall be done by a welder qualified to make beam and girder splices.

Where corrections require the deposition of additional weld metal, the sides of the area to be welded shall have sufficient slope to permit depositing new metal.

Defective or unsound welds shall be corrected either by removing and replacing the entire weld, or as follows:

Excessive convexity. Reduce to size by grinding off the excess weld metal.

Shrinkage cracks, cracks in base metal, craters and excessive porosity. Remove defective portions of base and weld metal down to sound metal and replace with additional sound weld metal.

Undercutting, undersize, and excessive concavity. Clean and deposit additional weld metal.

Overlapping and incomplete fusion. Remove and replace the defective portion of weld.

Slag inclusions. Remove the parts of the weld containing slag and replace with sound weld metal.

Removal of an adjacent base metal during welding. Clean and form full size by depositing additional weld metal.

Where corrections require the deposition of additional weld metal, the electrode used shall be smaller than that used for making the original weld. Surfaces shall be cleaned thoroughly before rewelding.

A cracked weld shall be removed throughout its length, unless the extent of the crack can be ascertained to be limited, in which case the weld metal shall be removed 2 inches beyond each end of the crack and repairs made.

Where work performed after the making of a deficient weld has made the weld inaccessible or has caused

new conditions making the correction of the deficiency dangerous or ineffectual, the original conditions shall be restored by removal of welds or members, or both, before making the necessary corrections, or else the deficiency shall be compensated by additional work according to a revised design approved by the Engineer.

Improperly fitted and misaligned parts shall be cut apart and re-welded.

Members distorted by the heat of welding shall be straightened by mechanical means or by the carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200°F as measured by Tempil-sticks or other approved methods for steel up to 65,000 psi yield strength. Parts to be heat straightened shall be substantially free of stress from external forces, except when mechanical means are used in conjunction with the application of heat.

Heat straightening of A514 steel shall be done only under rigidly controlled procedures, subject to the approval of the Engineer. In no case shall the maximum temperature of the steel exceed 1100°F. Sharp kinks and bends shall be cause for rejection of the material.

6. RADIOGRAPHIC INSPECTION

All grove welds designed to carry primary stresses shall be subject to radiographic inspection. When subjected to such inspections, the presence of any of the following defects in excess of the limits indicated will result in rejection of the defective weld until corrected.

- 1. Sections of welds shown to have any cracking, regardless of length or locations, incomplete fusion, overlapping, or inadequate penetration shall be judged unacceptable.
- 2. Inclusions less than one-sixteenth inch in greatest dimension including slag, porosity and other deleterious material, shall be permitted if well dispersed so that the sum of the greatest dimensions of the inclusions in any linear inch of welded joint shall not exceed three-eights inch.
- 3. Inclusions one-sixteenth inch or larger in greatest dimension shall be permitted provided such defects do not exceed the limits shown on Figure 1 or in paragraph (2) above.
- 4. There shall be no inclusion greater than one-sixteenth inch within one inch of the edge of part or member at the join or point of restraint.

NOTES:

- 1. The distance from the edge of an inclusion to the edge of a plate or to any intersecting weld shall be equal to or greater than the clearance between inclusion.
- 2. Inclusions with any dimension greater than 1/2 inch are not acceptable.
- 3. For joint thickness greater than 1-1/2 inches, the minimum allowable dimension and spacing of inclusions shall be the same as for 1-1/2 inch joints.
- 4. Values of (B) obtained by projecting horizontally from (A) are maximum value. Any value of (B) smaller than the maximum is satisfactory.

5. Values of (C) obtained by projecting vertically from (B) are minimum values. Any value of (C) larger than the minimum is satisfactory.

Radiographic inspection shall be made of A514 steel not less than 48 hours following the completion of the welding. For other steels, nondestructive inspection may begin immediately after welding and cleaning or grinding is completed.

Definitions: Porosity signifies gas pockets or any similar generally globular type voids. Fusion-type defect signifies slag inclusions and similar elongated defects.

7. REINFORCING STEEL GENERAL

Provisions are made herein for the welding of reinforcing steel by the manual shielded metal-arc process. Other processes may be permitted with the specific approval of the Engineer or may be specified on the plans.

Splicing of reinforcing steel by welding shall be done only at locations approved by the Engineer.

8. BASE METAL

Reinforcing steel to be welded shall be new billet steel conforming to ASTM Designation: A615. and shall also conform to the following chemical composition:

Maximum Carbon	0.40 Percent
Maximum Manganese	1.30 Percent

9. FILLER METAL

Low hydrogen electrodes as specified in Table 1 will be required for all welding or reinforcing steel. Drying of electrodes shall be as specified in Article, "Filler Metal" for Structural Steel.

10. PREHEAT AND INTERPASS TEMPERATURE

Minimum preheat and interpass temperatures shall be as shown in Table 3.

TABLE 3

CARBON RANGE	NO. 7 & SMALLER	NO. 8 & LARGEF	
Up to and including 0.30	None	100	
0.31 to 0.35 inclusive	None	150	
0.36 to 0.40 inclusive	100	250	
Unknown	250	400	

For widening projects, use carbon content and bar size of new steel to determine preheat required.

11. JOINT TYPES

For all bars No. 8 and larger, butt splices will be required. For No. 7 bars and smaller, lap splices will be required.

Fillet welds in lap splices shall be minimum of 4 inches in length and shall be welded on each side of the lap joint. For bars No. 5 and smaller, welding from one side of the lap will be permitted by the Engineer, when it is impractical to weld from both sides of the joint, and the weld shall be a minimum of 6 inches in length.

Lap welds shall meet the requirements specified in Table 4.

Where possible, all butt splices shall be made in the flat position. All butt splices, except horizontal, shall be as shown in Figure 2 with the back-up strip required. Horizontal splices shall be as shown in Figure 3.

		"b"	"t"	"c"	ELECTRODE
BAR SIZE	"a"	(MAX).	(MIN.)	(MAX.)	SIZE
No. 4	.04 in.	1/8 in.	1/8 in.	1/16 in.	1/8 in
No. 5	.05 in.	1/8 in.	1/16 in.	1/16 in.	5/32 in.
No. 6	.06 in.	1/8 in.	1/4 in.	1/16 in.	5/32 in.
No. 7	.07 in.	3/16 in.	5/16 in.	1/16 in.	5/32 in.

12. WIDENING PROJECTS

In general, the new reinforcing steel shall be either lap or butt spliced directly to the bar to be extended. When the reinforcement in the old portion of a structure is found to be of the wrong spacing, dowel bars long enough to develop the welded lap or butt splice and also develop the bar in bond, as required in the specification, "Reinforcing Steel", shall be welded to the old steel, and the new reinforcement placed at the correct spacing without welding to the old steel. No measurement or payment will be made for the dowels but will be subsidiary to the other items in the contract.

Both old and new reinforcement shall be cleaned thoroughly prior to the preparation of the joint.

13. RADIOGRAPHIC INSPECTION

When so designated on the plans, welded butt splices shall be radiographed. Weld quality shall be as follows: There shall be no cracks and the sum of the greatest dimensions of porosity and fusion-type defects shall not exceed one-tenth of the nominal bar diameter in inches.

14. MEASUREMENT AND PAYMENT

No measurement or payment will be made under this specification for the work prescribed but shall be considered subsidiary to the various other items in the proposal.

END OF SECTION

SECTION 055200 HANDRAILS AND RAILINGS

1. GENERAL

1.1 SECTION INCLUDES

A. Steel pipe tube handrails, balusters, and fittings.

1.2 DESIGN REQUIREMENTS

A. Railing assembly, wall rails, and attachments to resist force of 200 lbs. in any direction without damage or permanent set.

1.3 SUBMITTALS

A. Shop Drawings: Indicate profiles, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.4 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on drawings and shop drawings.

2. PRODUCTS

- 2.1 ACCEPTABLE PRODUCTS
 - A. TREX[®] Aluminum ADA Compliant Handrail System
 - B. Substitutions or approved equals. Substitutions must be provided for approval by the engineer prior to bid.

2.2 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- F. Accurately form components to each other and to structure.

3. EXECUTION

- 3.1 EXAMINATION
 - A. Verify that field conditions are acceptable and are ready to receive work.
 - B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Supply items required to be cast into concrete with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, epoxy grout and sleeves required for connecting railings to structure. Anchor railing to structure where required.

3.4 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 070120 ROUGH AND FINISH CARPENTRY (S-120)

1. GENERAL

Scope: Furnish all labor, equipment, and materials to properly execute all rough and finish carpentry. Delivery and Storage: Lumber delivered to the site shall be carefully piled off the ground in such a manner as to insure proper drainage, ventilation and protection from the weather.

2. MATERIALS

Grade marking: Each piece of framing and board lumber shall bear the official trademark and grademark of the manufacturer's association or the authorized inspection bureau under rules of which the lumber is manufactured, graded and purchased. Sizes, patterns and moisture content: Lumber shall be surfaced four sides. Lumber to be incorporated in the structure shall conform to the moisture-content requirement of the latest official grading rules of nationally recognized associations representing the lumber industry. Lumber treated with water-borne preservatives shall be dried to a moisture content not exceeding 19 percent after treatment. Plywood shall bear the mark of a recognized association of independent inspection agency that maintains continuing control over the quality of the plywood. The mark shall identify the plywood as to species, glue type and grade. Species and grades of lumber for the various uses shall, at the option of the contractor, be any one of the species listed for the purpose of and of the grade specified for the species used. Framing, bucks, sleepers, nailing strips and nailers: Cypress; eastern hemlock; southern pine - No. 2

Balsam fir; eastern white pine, Norway pine; eastern spruce - No. 1

Cedar; coast region Douglas fir, inland Douglas fir, white fir, west coast hemlock; western larch; Idaho white pine, lodgepole pine, ponderosa pine - Standard.

Redwood - sap common. Nails and Bolts shall be galvanized.

3. EXECUTION

Framing shall be closely fitted, accurately set to required lines and levels and rigidly secured in place. Nailing strips, unless otherwise shown, shall be continuous, cut with square ends in as long lengths as practicable, and rigidly secured in place. Interior finish shall be machine sanded at the mill and sandpapered smooth at the building when installed. Interior trim shall be standard stock moldings and members conforming to the following requirements, and of approved design and type. Interior trim shall be run with hollow backs. Joints shall be made in approved manner to conceal shrinkage and shall be tight. Trim shall be secured with fine finishing nails and with screws and glued as required. Nails shall be set for putty stopping. Wood finish shall be set straight, plumb or level, in perfect alignment, and shall be closely fitted. Moldings shall be mitered at exterior corners and coped at interior angles. Trim shall be drawn tight against finished surfaces.

END OF SECTION



scts\2025\City of Kingsville\Low Water Crossings\1- Drawings\2 - Civil\T1-TITLE SHEET.dwg LAYOUT NAME: TITLE SHEET PLOTTED: Thursday, April 10, 2025 - 10:40

CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE, KLEBERG COUNTY, TEXAS



CITY MAYOR..... CITY COMMISSIONER.... CITY COMMISSIONER....

CITY COMMISSIONER.... CITY COMMISSIONER.... CITY COMMISSIONER.... CITY ENGINEER....

CITY OF KINGSVILLE

-SAM FUGATE
-HECTOR HINOJOSA
-EDNA LOPEZ
-NORMA NELDA ALVAREZ
-LEO ALARCON
-RUTILIO "RUDY" MORA, JR., P.E., CFM

	CONSULTANT'S SHEET PROJECT NO		
	LESUS JANER JANEN		
DESCRIPTION		INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417 T.B.P.E. FIRM REGISTRATION #F - 10837	
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S) - BC(6)-21 S, & ATTENUATOR - BC(7)-21

FENCE & VERTICAL TRACKING - EC(1)-16 EROSION CONTROL LOG - EC(9)-16 & FENCE & BALED HAY-EC(1)-09

		CONSULTANT'S PROJECT NO.	SHEET
	DESCRIPTION	TOO765	sz/oo/te
			INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417 T.B.P.E. FIRM REGISTRATION #F - 10837
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	DATE		
	REVISION NO.		
	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	SHEET INDEX
	DATE	DRAWING NO	D.
	REVISION NO.	SHEET 2	of <u>29</u>
Ι.	<u>GENERAL NOTES</u>		
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1.	ALL CONSTRUCTION TO BE IN ACCORDANCE WITH CITY OF KINGSVILLE PUBLIC WORKS SPECIFICATIONS.		
2. 3.	ALL CONSTRUCTION TO BE COORDINATED WITH CITY OF KINGSVILLE. CONTRACTOR SHALL OBTAIN ALL REGULATORY PERMITS AND COST TO BE INCIDENTAL TO BID ITEMS.		
4.	ANY FINES AND/OR PENALTIES FOR FAILURE TO MAINTAIN AND/OR IMPLEMENT EROSION AND SEDIMENT CONTROL SHALL BE THE RESPONSIBILITY OF CONTRACTOR.		
5. 6	CONCRETE SHALL BE SAW CUT WHERE AN EXISTING CONCRETE STRUCTURE IS TO BE PARTIALLY REMOVED. THE STORM WATER POLILITION PREVENTION PLAN SHALL CONSIST OF USING THE BID ITEMS SEEDING, ROCK FILTER DAM AND SILT FENCE AS		
о. 7	SHOWN IN THE PLANS AND DETAILS AND PER THE S.W.P.P.P.		
<i>i</i> .	UNSAFE CONDITIONS, AND IN THE REGULATIONS AND HAZARDS WHICH APPLY TO THE AREA IN WHICH THE WORK WILL TAKE PLACE.		
8.	FOR PROVIDING PROTECTION OF PERSONS AND PROPERTY, AND FOR PROVIDING SAFE WORKING CONDITIONS THROUGHOUT THE WORK		
	PROGRESS. ALL AREAS ADJACENT TO THE CONSTRUCTION AREA OR AFFECTED BY THE CONSTRUCTION MUST BE PROTECTED FROM DAMAGE, CLEANED, AND RESTORED TO THE ORIGINAL CONDITION AT NO ADDITIONAL EXPENSE TO THE CITY OF KINGSVILLE.		
9.	THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL CLEARANCES AND PERMITS REQUIRED BY THE LOCAL, STATE FEDERAL ENTITIES AS NECESSARY, PRIOR TO THE COMMENCEMENT OF THE WORK.		
10.	WORK AREAS SHALL BE KEPT, AT ALL TIMES, FREE OF DEBRIS AND NON - HAZARDOUS MATERIAL TO THE SATISFACTION OF CITY OF KINGSVILLE PUBLIC WORK, ALL EXISTING PIPING AND CONDUITS SHALL HAVE TEMPORARY PROTECTION DURING CONSTRUCTION. THE CONTRACTOR SHALL		
	COORDINATE STORAGE OF MATERIALS, PARKING OF VEHICLES, AND RESTRICTIONS OF WORK WITH THE CITY OF KINGSVILLE PUBLIC WORKS,		
	SATISFACTION OF THE CITY OF KINGSVILLE PUBLIC WORKS.		
11. 12.	THE SEQUENCE OF CONSTRUCTION SHALL BE SCHEDULED AND COORDINATED WITH CITY OF KINGSVILLE PUBLIC WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF EXISTING CONDITIONS, AND SHALL PERFORM FIELD MEASUREMENTS		
	PRIOR TO FABRICATION AND/OR PURCHASE OF ANY MATERIAL AND SHALL CONTACT THE ENGINEER SHOULD EXISTING CONDITIONS BE DIFFERENT FROM THE DESIGN DRAWINGS FOR THIS PROJECT. CONFLICTS ARISING DUE TO LACK OF COORDINATION SHALL BE THE		
13.	RESPONSIBILITY AND AT THE EXPENSE OF THE CONTRACTOR. THE CONTRACTOR SHALL NOT FABRICATE OR INSTALL MEMBERS AS SHOWN ON THE DRAWINGS IF THERE ARE DISCREPANCIES OR CONFLICTS		
10.	BETWEEN THE EXISTING CONDITIONS AND THE INFORMATION SHOWN ON THE DRAWINGS, UNTIL SUCH DISCREPANCIES HAVE BEEN RESOLVED.		
	ATTENTION OF THE ENGINEER BY SUBMITTING A REQUEST FOR INFORMATION (RFI).		
14.	ANY REQUIRED CHANGES TO THE DRAWINGS RESULTING FROM THE ACCEPTANCE OF ALTERNATES AND/OR SUBSTITUTIONS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.		
15.	ALL CONTRACT WORK IN THESE DRAWINGS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST EDITIONS OF THE FOLLOWING NATIONAL CODES AND STANDARDS:		
	B. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE 7-22)		
	C. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)		
	D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)		
	E. INTERNATIONAL FIRE CODE (IFC 2024)		
	F. I EXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (2011)		
6.	THE CONTRACTOR SHALL DISPOSE OF ALL MATERIALS REMOVED WHICH ARE NOT TO BE REINSTALLED OR SALVAGED ON THE PROJECT.		
17.	EXCAVATIONS SHALL NOT BE MADE DURING INCLEMENT WEATHER. WATER ACCUMULATION EXCEEDING 1 INCH IN THE EXCAVATIONS SHALL BE		
18.	PUMPED OUT BEFORE ANY CONCRETE IS PLACED. PERMITTING ASSOCIATED WITH THE PROJECT INCLUDES BUT ARE NOT LIMITED TO THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY		
	(TCEQ) CONSTRUCTION SITE STORM WATER PERMIT NOTICE OF INTENT (NOI) FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES UNDER THE TPDES CONSTRUCTION GENERAL PERMIT (TXR 150000). THIS PERMIT IS REQUIRED FOR CONSTRUCTION		
10	ACTIVITIES INCLUDING CLEARING, GRADING, AND EXCAVATION ACTIVITIES THAT DISTURB BEYOND THE LIMIT IS RECONSTRUCTION.		
19.	AS-BUILT PLANS SHALL BE AVAILABLE ON-SITE AT ALL TIMES FOR INSPECTION.		
20.	WORK. THE CONTRACTOR SHALL VISIT THE PROJECT SITE IN ORDER TO BECOME FAMILIAR WITH THE SITE CONDITIONS PRIOR TO COMMENCING ANY WORK. THE CONTRACTOR IS TO RESEARCH THE EXISTING CONDITIONS AND THE PROPOSED WORK TO BECOME FULLY AWARE OF THE INTENT		
21.	OF THE WORK. THE CONTRACTOR WILL BE REQUIRED TO OBTAIN ALL NECESSARY PERMITS AND PAY ASSOCIATED FEES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE CHANGES IN DRAINAGE, WATERLINE, AND SANITARY SEWER GRADES TO PERMIT THE		
	LINES TO PASS ALL UNDERGROUND LINES, AS AUTHORIZED BY THE ENGINEER, AND IN ACCORDANCE WITH TCEQ'S "TEXAS ADMINISTRATIVE CODE" CHAPTER 317, APPENDIX E. "SEPARATION DISTANCES"		
22.	DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR MAY ENCOUNTER EXISTING PIPES WHICH ARE NO LONGER IN SERVICE. THE		
	REPRESENTATIVE THAT THE EXISTING PIPE IS ABANDONED. ONCE IT IS AGREED THAT THE LINE IS ABANDONED, THEN THE CONTRACTOR SHALL		
	REMOVE AND DISPOSE OF SAID PIPE. THIS GENERALLY APPLIES WHEN REMOVING DRAINAGE CULVERTS. ACTIVE DRAINAGE CULVERTS MUST BE REINSTALLED IF THEY ARE REMOVED FOR THE PURPOSE OF CONSTRUCTION. ANY ABANDONED LINES TO REMAIN IN PLACE SHALL BE FULLY		
23.	GROUTED. CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION OF EXISTING IMPROVEMENTS ON SITE, INCLUDING ABOVE GROUND AND		
	UNDERGROUND. CONTRACTOR SHALL REMOVE BELOW-GRADE STRUCTURES UP TO THREE FEET BELOW NATURAL GRADE OR TO SUCH DEPTH AS MAY BE REQUIRED TO MAINTAIN SUBSURFACE STABILITY OF THE SOIL.		
24.	CONTRACTOR SHALL BACKFILL ALL VOIDS LEFT BY DEMOLITION AND COMPACT THE DISTURBED SOIL IN A MANNER SUITABLE TO FINAL IMPROVEMENTS		
25.	ALL DEMOLISHED MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE PROMPTLY REMOVED FROM THE SITE UNLESS		
26.	ANY DAMAGE TO EXISTING DRAINAGE, PRIVATE UTILITY, OR OTHER STRUCTURES SHALL BE REPAIRED TO PRE-CONSTRUCTION CONDITION AT		
27.	CONTRACTOR'S EXPENSE. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THE SAFETY OF THE PEDESTRIANS AND ALL VEHICULAR TRAFFIC FROM CONSTRUCTION		
28	RELATED ACTIVITIES DURING THE COURSE OF THIS PROJECT. THE CONTRACTOR SHALL COMPLY WITH ALL GOVERNMENTAL ONE-CALL REQUIREMENTS AND OTHER REQUIRATIONS WITH DECARD TO EXISTING		
_U.	UNDERGROUND UTILITIES, PIPELINES, AND OTHER FACILITIES A MINIMUM OF 48 HOURS IN ADVANCE OF CONSTRUCTION.		
29.	ALL OPEN EXCAVATIONS SHALL BE ENCLOSED WITH ORANGE SAFETY FENCE AT ALL TIMES. OPEN ROADWAY EXCAVATIONS SHALL BE CLOSED OVERNIGHT UNLESS APPROVED BY THE ENGINEER. ALL WORK SHALL BE PERFORMED DURING DAYLIGHT HOURS.		
30.	VEGETATION, BROKEN CONCRETE, RC PIPE, AND OTHER UNWANTED MATERIAL BECOMES THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR. THE COST OF ALL HAULING IS CONSIDERED SUBSIDIARY; THEREFORE, NO DIRECT PAYMENT		
31	WILL BE MADE TO THE CONTRACTOR. THE QUANTITIES OF THE WORK AND MATERIALS SHOWN ON THE PLANS REPRESENT THE WORK TO BE PERFORMED. MATERIALS TO BE		
	FURNISHED, AND ARE FOR THE PURPOSE OF COMPARING THE BIDS ON A UNIFORM BASIS. PAYMENTS WILL BE MADE BY THE CITY OF KINGSVILLE		
32.	CONTRACTOR SHALL SUBMIT A SUBMITTAL FORM FOR AN APPROVAL OF MATERIALS TO THE ENGINEER PRIOR TO PURCHASING.		
33.	TRENCH EXCAVATION SHALL NOT PRECEDE BACKFILL BY MORE THAN 200 FEET. NO TRENCH SHALL BE LEFT OPEN AFTER NORMAL WORKING HOURS.		
34.	THE DRAWING SHOWS AS MUCH INFORMATION AS CAN BE REASONABLY OBTAINED BY THE SURVEY CREWS AND FROM EXISTING RECORDS REGARDING THE LOCATION AND NATURE OF PIPELINES, STORM SEWER, WATERLINES, SANITARY SEWER, TELEPHONE CONDUITS, FTC.		
	HOWEVER THE ACCURACY AND COMPLETENESS OF SUCH INFORMATION IS NOT GUARANTEED. IT SHALL BE THE CONTRACTORS RESPONSIBILITY		
35.	UNDERGROUND UTILITY LINES SHOWN ON THE PLANS CONSTITUTE AN ATTEMPT BY THE ENGINEER TO LOCATE THESE LINES FOR THE		
	THEIR PROTECTION. IN THE EVENT OF DAMAGE TO UNDERGROUND UTILITIES, WHETHER SHOWN OR NOT ON THE DRAWINGS, THE CONTRACTOR		
	SHALL MAKE THE NECESSARY REPAIRS TO PLACE THE FACILITIES BACK IN SERVICE. ALL SUCH REPAIRS SHALL CONFORM TO THE REQUIREMENTS OF THE COMPANY OR AGENCY OPERATING THE FACILITY. DAMAGE BY THE CONTRACTOR TO EXISTING UTILITIES SHALL BE		
	REPORTED IMMEDIATELY TO THE OWNER OF THE UTILITY AND THE ENGINEER. THE COST OF DAMAGE AND/OR REPAIR TO SAID UTILITY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. NO PAYMENT WILL BE MADE FOR DELAYS DUE TO UTILITY CONFLICTS.		
36.	PRIOR TO THE COMMENCEMENT OF ANY WORK AT PROJECT SITE, CONTRACTOR SHALL VERIFY WITH CITY OF KINGSVILLE PUBLIC WORKS. THAT		
7	ACTIVITIES LOCATED IN THIS SITE.		
57.	CONTRACTOR SHALL DE RESPONSIBLE FOR PROVIDING AND MAINTAINING TRAFFIC CONTROL THROUGHOUT THE DURATION OF THE CONTRACT IN ACCORDANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", TRAFFIC CONTROL PLANS AND BARRICADE		
38.	AND CONSTRUCTION SHEETS. THE CONTRACTOR SHALL NOTIFY PARTIES AFFECTED BY CONSTRUCTION ACTIVITIES A MINIMUM OF 48 HOURS IN ADVANCE OF CONSTRUCTION.		
	THE FOLLOWING ARE TELEPHONE NUMBERS FOR THE ENTITIES MOST LIKELY TO BE AFFECTED:		
	DIG TESS		
	TEXAS ONE CALL SYSTEM		
	TEXAS EXCAVATION SAFETY SYSTEM		
	LONE STAR NOTIFICATION COMPANY		
	NUEGES ELECTRIC COOP		
	SOUTH TEXAS WATER AUTHORITY		
	IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY NO OTHER ENTITIES WILL BE AFFECTED.		

SITE EXCAVATION AND GRADING

COMPLETELY REMOVE ALL TREES, SHRUBS, AND STUMPS FROM THE CONSTRUCTION AREA. REMOVE ALL CONCRETE SLABS, CONCRETE WALLS, FOUNDATIONS, ROADWAYS, ETC., ON THE SITE AS REQUIRED TO PROPERLY CONSTRUCT THE PROJECT.

BEFORE EXCAVATION HAS BEGUN, STRIP THE TOPSOIL AS INDICATED ON PLANS FROM AREAS TO BE EXCAVATED OR OCCUPIED BY ROADS, SIDEWALKS, ETC., AND PILE IN DESIGNATED LOCATIONS WHERE IT WILL NOT INTERFERE WITH BUILDINGS OR UTILITY OPERATIONS. STRIPPED TOPSOIL SHALL BE FREE FROM LARGE STONES AND DEBRIS. USE TOPSOIL FOR FINISH GRADING. EXCESS TOPSOIL MAY BE USED FOR COMMON SITE FILLS IF AN ADEQUATE STOCKPILE IS RETAINED FOR INISH GRADING. ALL EXCAVATION IS TO BE UNCLASSIFIED; I.E., THE REMOVAL OF ALL MATERIALS AS ENCOUNTERED, WITH NO ADDITIONAL PAYMENTS FOR ROCK EXCAVATION

EXCEPT FOR CHANGES IN WORK FROM THAT SHOWN ON THE CONTRACT DRAWINGS. PERFORM EXCAVATION OF EVERY TYPE OF MATERIAL ENCOUNTERED WITHIN THE LIMITS OF THE PROJECT, TO THE LINES, GRADES AND ELEVATIONS INDICATED AND AS SPECIFIED HEREIN. PERFORM EXCAVATION AND FILLING IN A MANNER AND SEQUENCE THAT WILL PROVIDE DRAINAGE AT ALL TIMES.

KEEP ALL EXCAVATIONS DRY BY DIVERTING OR PUMPING SEEPAGE OR SURFACE WATER FROM EXCAVATIONS. CONSTRUCT FILLS AT THE LOCATION AND TO THE LINES AND GRADES AS INDICATED. THE COMPLETE FILL SHALL CONFORM TO THE SHAPE OF THE TYPICAL SECTIONS INDICATED OR SHALL MEET THE REQUIREMENTS OF THE PARTICULAR CASE. ALL FILL, EXCEPT FILL UNDER THE BUILDING AREA, SHALL BE SOIL FILL. JSE SATISFACTORY ON-SITE SOILS REMOVED FROM THE EXCAVATION TO FORM THE FILL. MATERIAL REQUIRED FOR FILLS IN EXCESS OF THAT PRODUCED BY EXCAVATING WITHIN THE GRADING LIMITS SHALL BE TAKEN FROM APPROVED OFF-SITE AREAS SELECTED BY THE CONTRACTOR. PLACE THE MATERIAL IN SUCCESSIVE HORIZONTAL LAYERS 8" IN LOOSE DEPTH AND COMPACT TO A MINIMUM OF 95% OF STANDARD PROCTOR IN ACCORDANCE WITH ASTM D698 AT MOISTURE CONTENTS -1% TO +3% OF OPTIMUM.

COMPLETE ALL GRADING NECESSARY TO BRING THE ENTIRE AREA SHOWN ON THE DRAWINGS TO THE SUBGRADE LEVELS INDICATED ON THE PLANS AND DETAILS. GRADES NOT OTHERWISE INDICATED SHALL BE UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE GIVEN, OR BETWEEN SUCH POINTS AND EXISTING FINISH GRADES. ROUND OFF ABRUPT CHANGES IN SLOPES.

CONTRACTOR TO VERIFY QUANTITIES SHOWN DURING BID PROCESS TO INSURE THEY ARE SUFFICIENT TO COMPLETE THE PROJECT AS INTENDED AND TO THE LINES AND GRADES SHOWN, AND HE SHALL MAKE ANY ADJUSTMENTS HE DEEMS NECESSARY TO INSURE HE HAS ACCOUNTED FOR SHRINK, SWELL, LOSS, ETC. THE QUANTITIES SHOWN ARE INTENDED AS INFORMATION ONLY TO ASSIST THE THE CONTRACTOR IN PREPARING HIS LUMP SUM PROPOSAL. CONTRACTOR IS RESPONSIBLE TO COMPLETE THE PROJECT ACCORDING TO THE PLANS AT THE PRICE HE HAS SPECIFIED IN HIS PROPOSAL. EXISTING MAILBOXES SHALL BE RELOCATED AS NECESSARY.

DIRT DEBRIS SHALL BE PROPERTY OF THE CITY OF KINGSVILLE AND DELIVERED TO 348 E. COUNTY ROAD 2130 KINGSVILLE TX. 78363.

TRAFFIC CONTROL

THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A TRAFFIC CONTROL PLAN AND MAINTAIN THE TRAFFIC CONTROL THROUGHOUT THE DURATION OF THE CONTRACT IN ACCORDANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND THE TXDOT STANDARDS SHEETS. CONTRACTOR SHALL COORDINATE WITH CITY OF KINGSVILLE PUBLIC WORKS AND ANY LOCAL EMERGENCY RESPONSE AGENCIES FOR ROAD CLOSURES. SEE SPECIAL NOTE

ALL TRAFFIC CONTROL DEVICES SHALL CONFORM WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND IN ACCORDANCE WITH THE TRAFFIC CONTROL DEVICE STANDARD DETAILS.

THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL TRAFFIC CONTROL DEVICES DURING THE COURSE OF THE CONSTRUCTION PERIOD AS REQUIRED BY HE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) MANUAL.

EQUIPMENT AND MATERIALS SHALL NOT BE STORED ON PUBLIC RIGHT-OF-WAY AT ANY TIME DURING THE COURSE OF THE CONSTRUCTION PERIOD. ANY MATERIAL AND EQUIPMENT APPROVED BY THE ENGINEER FOR THE TEMPORARY PLACEMENT ALONG THE PUBLIC RIGHT-OF-WAY SHALL BE ADEQUATELY BARRICADED WITH TYPE II BARRICADES FOR EACH DIRECTION OF TRAVEL AND SHALL NOT BE PLACED WITHIN FIVE (5) FEET OF THE STREET PAVEMENT. THE CONTRACTOR SHALL MAINTAIN ALL REGULATORY SIGNS DURING THE CONSTRUCTION PERIOD.

ALL CONSTRUCTION WARNING SIGNS MAY BE MOUNTED ON PORTABLE DEVICES AND/OR GROUND MOUNTED.

HOULD ANY TRAFFIC SIGN, SIGN POST OR ITS FOUNDATION BE DAMAGED, CONTRACTOR SHALL REPORT SUCH INFORMATION IMMEDIATELY TO THE ATTENTION OF THE CITY OF KINGSVILLE PUBLIC WORKS.

THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL DRIVEWAYS DURING THE CONSTRUCTION PERIOD. ALL SIGNS AND BARRICADES USED FOR LANE CLOSURES AND/OR PROTECTION SHALL BE EQUIPPED WITH FLASHING WARNING LIGHTS IF SUCH SIGNS AND

BARRICADES ARE TO BE IN PLACE DURING HOURS OF DARKNESS. ONE LIGHT SHALL BE USED PER SIGN OR BARRICADE. ADDITIONAL CHANNELIZING AND OTHER APPROPRIATE TRAFFIC CONTROL DEVICES MAY BE REQUIRED ACCORDING TO THE ENGINEER AND/OR THE

DEPARTMENT OF THE CITY OF KINGSVILLE PUBLIC WORKS. AFETY BARRICADE FENCING SHALL BE HIGH DENSITY POLYETHYLENE TENSAR-UX4050 (SB-ORANGE-4'HIGH).

CONTRACTOR SHALL COORDINATE ANY WORK IN THE PROXIMITY TO THE CITY OF KINGSVILLE PUBLIC WORKS REPRESENTATIVE.

HE CONTRACTOR SHALL MAINTAIN STREET ACCESS TO THE RESIDENTS OF THE STREETS BEING WORKED.

STREETS

ALL STREET DIMENSIONS SHOWN ON PLANS ARE TO THE BACK OF CURBS UNLESS NOTED OTHERWISE.

STREET MILLING IS MEASURED FROM EDGE TO EDGE THROUGHOUT THE LIMITS OF PAVEMENT CONSTRUCTION,UNLESS SPECIFIED IN THE PLAN SHEETS. WHERE EXISTING ASPHALT AND CONCRETE ARE TO BE CUT, THESE CUTS SHALL BE VERTICAL AND MADE WITH A SAW.

PRIOR TO PLACEMENT OF GEOGRID AND LIMESTONE BASE, THE EXISTING SUBGRADE SHALL BE PROOF ROLLED AND CEMENT STABILIZED.

FLEXIBLE BASE SHALL BE TYPE A GRADE 1 CRUSHED LIMESTONE, IN ACCORDANCE WITH TXDOT STANDARD SPECIFICATION (1993) ITEM 247 RECYCLED BASE SHALL BE COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY (ASTM D1557) AT NOT LESS THAN 2% BELOW OPTIMUM MOISTURE AND NO MORE THAN 2% ABOVE OPTIMUM MOISTURE.

PRIME COAT MATERIAL SHALL BE MC-30 APPLIED AT A RATE OF 0.15 GAL/SY.

YPES AND RATES FOR SURFACE COURSES SHALL BE: TWO COURSE SURFACE TREATMENT.

ARE SHALL BE TAKEN TO PROTECT CURB AND GUTTER AND OTHER CONCRETE SURFACES FROM ASPHALT SPLATTER DURING PRIMING AND SEALING **PERATIONS** HMACP TRANSITIONS TO EXISTING PAVEMENTS ON COUNTY ROAD 67 INTERSECTION SHALL BE TRANSITIONED OVER TO PRODUCE A SMOOTH RIDE AND

SHALL BE CHECKED WITH A STRAIGHT EDGE PRIOR TO COMPLETION, SEE PLANS. LONGITUDINAL HMACP JOINT LOCATIONS SHALL BE AS APPROVED BY HE ENGINEER PRIMING AND HOT-MIX PLACING OPERATINGS SHALL NOT BE CONDUCTED ON DAYS FOR WHICH AN OZONE ADVISORY HAS BEEN ISSUED, EXCEPT FOR

REPAIRS

REFLECTORIZED PAVEMENT MARKING FOR STOP BAR SHALL BE THERMOPLASTIC AND REFLECTIVE (MAY BE PREFABRICATED). HMAC BASE COURSE SHALL FOLLOW COMPLETED FLEXIBLE BASE COURSE WITHIN 5 DAYS.

EXISTING DRIVEWAYS AND CULVERTS SHALL BE REMOVED AS REQUIRED TO CONSTRUCT NEW IMPROVEMENTS. REMOVAL OF THESE ITEMS IS SUBSIDIARY TO STREET EXCAVATION.

RIVEWAY TYPE, SIZE AND LOCATION SHALL BE AS SHOWN ON THE "DRIVEWAY SUMMARY SHEET AND DETAILS". MILLINGS SHALL BE THE PROPERTY OF THE CITY OF KINGSVILLE AND DELIVERED TO 1300 E. CORRAL ST., KINGSVILLE, TX 78363

UTILITIES AND STORM SEWER

ALL ABANDONED PIPES (OLD WATERLINES, DITCH CULVERTS, SHALLOW UTILITY SERVICES) WITHIN LIMITS OF NEW ROW SHALL BE REMOVED AND PROPERLY DISPOSED. THIS GENERALLY APPLIES TO ALL UNWANTED PIPES THAT ARE WITHIN A FOOT OF SUBGRADE AND DITCH CULVERTS AND ANY ABANDONED LINES TO REMAIN IN PLACE SHALL BE CAPPED AT THE ENDS WHEN CUT FOR PROPOSED CONSTRUCTION, UNLESS OTHERWISE NOTED. THIS ACTIVITY WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO.

CONTRACTOR SHALL COORDINATE WITH THE CITY OF KINGSVILLE PUBLIC WORKS REPRESENTATIVE, TO EVALUATE IF EXISTING STORM WATER DRAINAGE CULVERT IS SALVAGEABLE. SALVAGED STORM WATER CULVERT SHALL BE REINSTALLED AT DESIGNED FLOWLINE ELEVATION AS SHOWN ON PLANS. DISPOSAL OF ALL NON-SALVAGEABLE STORM WATER CULVERTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

ALL STORM SEWER PIPE SHALL BE CLASS IV REINFORCED CONCRETE PIPE UNDER DRIVEWAYS AND CLASS V REINFORCED CONCRETE PIPE UNDER STREET. WITH YPE B WALL AND TONGUE-AND-GROOVE JOINTS PER ASTM C-76 UNLESS NOTED OTHERWISE ON THE DRAWINGS. CLASS V REINFORCED CONCRETE PIPE SHALL BE JSED UNDER ROADS

ALL EXISTING VALVES AND MANHOLES REQUIRING ADJUSTMENT SHALL BE LOCATED BY STATION AND OFFSET AND TIED TO EXISTING FEATURES THAT WILL REMAIN IN PLACE. ALL EXISTING VALVES AND MANHOLES SHALL BE EXTENDED TO FINISH GRADE. ALL EXISTING UTILITY COVERS TO REMAIN IN SERVICE SHALL BE ADJUSTED TO PAVEMENT GRADE. ALL ADJUSTMENTS WILL BE CONSIDERED SUBSIDIARY AND WILL NOT BE PAID DIRECTLY.

THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PROTECT EXISTING UTILITIES. ALL PIPES AND UTILITIES DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED TO THE OWNER'S SATISFACTION, WITH NO SEPARATE PAYMENT.

PIPE COLLAR SHALL BE USED WHERE PROPOSED STORM SEWER IS TO BE CONNECTED TO EXISTING STORM SEWER. PIPE COLLARS SHALL NOT BE PAID FOR SEPARATELY BUT CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS. PIPE COLLARS SHALL NOT BE REQUIRED AT TONGUE AND GROOVE CONNECTIONS. INLESS SHOWN OTHERWISE IN THE PLANS OR SPECIFICATIONS, DEWATERING OF DITCHES WILL NOT BE PAID FOR DIRECTLY BUT CONSIDERED SUBSIDIARY TO THE TEMS IT MAY BE ASSOCIATED WITH.

ALL ACP DESIGNATED FOR REMOVAL SHALL BE DISPOSED OF IN STRICT ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS. DISPOSAL OF AC PIPE WILL NOT BE PAID DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO UTILITY IMPROVEMENTS.

SANITARY SEWER NOTES

ALL SEWERS AND MANHOLES SHALL BE TESTED IN ACCORDANCE WITH TCEQ.

IT IS REQUIRED THAT A CCTV INSPECTION AND REPORT OF THE EXISTING LINES MUST BE SUBMITTED AND APPROVED BY THE CITY OF KINGSVILLE PUBLIC WORKS PRIOR TO ACCEPTANCE.

NEITHER BLUE PVC PIPE NOR DUCTILE IRON PIPE SHALL BE USED FOR SANITARY SEWERS.

WHERE NEW SANITARY SEWERS ARE TO BE PLACED ADJACENT TO AN EXISTING WATERLINE AT A LATERAL CLEARANCE OF LESS THAN 9 FEET, THAT SECTION OF SEWER SHALL BE PRESSURE RATED PVC, AWWA DR18 (C905) NON-BLUE COLORED (GREEN COLOR).

ALL MANHOLES INSTALLED ON THIS PROJECT SHALL BE FIBERGLASS. THE MANHOLE MANUFACTURER SHALL PROVIDE CERTIFICATION AND DESIGN CALCULATIONS TO THE CITY OF KINGSVILLE PUBLIC WORKS SHOWING THAT THE MANHOLES ARE DESIGNED FOR TRAFFIC LOADING (H20 DESIGN VEHICLE) AND THE APPLICABLE SOIL AND HYDROSTATIC PRESSURE LOADING CONDITIONS. MINIMUM WALL THICKNESS SHALL BE 0.50 INCH. IF REQUIRED BY THE MANUFACTURERS DESIGN, HORIZONTAL RIBS AND/OR VERTICAL STIFFENERS MAY BE UTILIZED TO ACHIEVE REQUIRED DESIGN CHARACTERISTICS.

MANHOLES SHALL BE DESIGNED AND FABRICATED BY CONTAINMENT SOLUTION, INC., OR ENGINEER APPROVED EQUAL.

THE CONTRACTOR SHALL ENSURE THAT THE SUBGRADE IS PROPERLY COMPACTED, AND BACKFILL IS PLACED PROPERLY, TO PREVENT THE MANHOLE FROM SHIFTING OR SETTLING AFTER INSTALLATION.

CLEANING OR PURGING OF EXISTING SANITARY SEWER LINES REQUIRED FOR CONNECTING INTO SANITARY SEWER SYSTEM SHALL BE THE CONTRACTORS RESPONSIBILITY. ANY ACP DESIGNATED FOR REMOVAL SHELL BE DISPOSED OF IN STRICT ACCORDANCE WITH LOCAL, STATE, & FEDERAL REGULATIONS. DISPOSAL OF AC PIPE WILL NOT BE PAID DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO UTILITY IMPROVEMENTS.

NOTE: CONTRACT

CITY OF KIN **KLEBERG C** CITY OF KIN CITY OF KIN KINGSVILLE TXDOT ALICI

- CONTAMINATED SOIL.

- FORTH BY USFWS.
- SHOULD BE NOTIFIED.

- SPECIES.

- ARE PRESENT.
- WETLANDS.
- REGULATIONS.
- DISPOSAL FACILITY.
- WATER.

SPECIAL NOTE:

OR TO NOTIFY ALL AGENCIES LISTED E	BELOW AT LEAST 2 WEEKS
GSVILLE PUBLIC WORKS	(361) 595-8041
OUNTY SHERIFF'S DEPARTMENT	(361) 595-8500
GSVILLE POLICE	(361) 592-4311
GSVILLE FD/EMT	(361) 592-6445
I.S.D	(361) 592-3387
E AREA OFFICE	(361) 661-7050

CONTRACTOR SHALL NOTIFY PROPERTY OWNERS AFFECTED BY CONSTRUCTION ACTIVITIES AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION.

7. ENVIRONMENTAL

1. ALL EFFORTS WILL BE MADE THROUGH PROPER CONSTRUCTION METHODS TO ENSURE DUST CONTROL AND PROPERLY FUNCTIONING EQUIPMENT.

2. IF ANY PERSONNEL IDENTIFY AN OBSERVABLE SHEEN OR PETROLEUM ODOR DURING EXCAVATION, "STOP WORK AUTHORITY" MUST BE EMPLOYED UNTIL IT IS DETERMINED TO BE SAFE TO PROCEED BY A QUALIFIED PROFESSIONAL.

3. DURING CONSTRUCTION, IF DISCOLORED OR STAINED SOIL OR SOIL CONTAINING A CHEMICAL ODOR IS DISCOVERED. WORK SHOULD BE CEASE IN THE IMMEDIATE AREA AND TCEQ SHOULD BE CONTACTED FOR FURTHER INSTRUCTIONS. THESE ARE SIGNS OF

4. DUE TO THE PROXIMITY OF THE PROJECT TO A HISTORIC CLOSED LANDFILL, IT IS RECOMMENDED THAT THE CONTRACTOR UTILIZE AIR MONITORING EQUIPMENT FOR POTENTIAL METHANE GAS MIGRATION AND INCURSION ON ENCLOSED SPACES. 5. CONTRACTOR SHALL EMPLOY NATIONWIDE STANDARD CONSERVATION MEASURES SET

6. PROVIDE CONSTRUCTION WORKERS WITH A LIST OF FEDERAL THREATENED AND ENDANGERED SPECIES AND STATE LISTED RARE SPECIES. IF CONSTRUCTION WORKERS IDENTIFY OR ENCOUNTER THREATENED OR ENDANGERED SPECIES OR STATE LISTED RARE SPECIES, CONSTRUCTION SHOULD CEASE IMMEDIATELY AND TEXAS PARKS & WILDLIFE SHOULD BE CONTACTED FOR GUIDANCE.

AVOID ACTIVITIES REQUIRING VEGETATION REMOVAL OR DISTURBANCE DURING PEAK BIRD NESTING SEASON (MARCH THROUGH AUGUST) TO PREVENT THE DESTRUCTION OF MIGRATORY BIRDS, NESTS, OR EGGS. WHEN PROJECT ACTIVITIES CANNOT OCCUR OUTSIDE THE BIRD NESTING SEASON, CONDUCT SURVEYS PRIOR TO SCHEDULED ACTIVITY TO DETERMINE IF ACTIVE NESTS ARE PRESENT WITHIN THE AREA OF IMPACT. IF EVIDENCE OF MIGRATORY BIRDS IS FOUND, A QUALIFIED BIOLOGIST WITH USFWS

THE PROJECT SHALL BE IMPLEMENTED USING BEST MANAGEMENT PRACTICES DESIGNED TO PROTECT IMPROVEMENTS FROM FLOOD DAMAGE

9. THE PROJECT SHALL BE IMPLEMENTED USING BEST MANAGEMENT PRACTICES DESIGNED TO PROTECT NATURAL LANDSCAPES THAT SERVE TO MAINTAIN OR RESTORE NATURAL HYDROLOGY THROUGH INFILTRATION.

10. THE CONSULTING ENGINEER SHALL TAKE INTO CONSIDERATION ADDITIONAL SPECIFICATIONS TO MINIMIZE DAMAGE TO AND/OR RESTORE THE NATIVE PLANT

11. THE PROJECT SHALL NOT LEAD TO ANY SIGNIFICANT INCREASE IN IMPERMEABLE COVER AND SHALL HAVE NO NEGATIVE IMPACTS ON THE FLOODPLAIN, AS ALL LINES WILL BE SUBSURFACE, AND THE PROJECT AREA WILL BE RESTORED TO PRE-PROJECT CONDITIONS UPON COMPLETION.

12. ADDITIONALLY, PRIOR TO CONSTRUCTION, THE PROJECT PLANS WILL MEET ANY APPLICABLE, ADDITIONAL LOCAL FLOODPLAIN REQUIREMENTS SET FORTH BY THE COMMUNITY'S FLOODPLAIN ADMINISTRATOR.

13. ALL STATE AND LOCAL FLOODPLAIN PROTECTION PROCEDURES WILL BE FOLLOWED. 14. IF HISTORIC PROPERTIES ARE DISCOVERED OR CULTURAL MATERIALS ARE

ENCOUNTERED DURING CONSTRUCTION OR DISTURBANCE ACTIVITIES OR

UNANTICIPATED EFFECTS ON HISTORIC PROPERTIES ARE FOUND, WORK SHOULD CEASE IN THE IMMEDIATE AREA AND THC'S HISTORY PROGRAMS, THC'S ARCHEOLOGY DIVISION, AND THE TEXAS GENERAL LAND OFFICE (GLO) SHOULD BE CONTACTED TO CONSULT ON FURTHER ACTIONS THAT MAY BE NECESSARY TO PROTECT HISTORIC PROPERTIES OR CULTURAL REMAINS. WORK CAN CONTINUE IN AREAS WHERE NO HISTORIC PROPERTIES

WHILE THERE SHALL BE NO IMPACT TO WETLANDS, BEST MANAGEMENT PRACTICES SHOULD BE USED TO ENSURE EROSION CONTROL AND TO FURTHER PROTECT OFFSITE

CONSTRUCTION AND WASTE DISPOSAL ACTIVITIES MUST BE COMPLETED IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL PERMITS, STATUTES, AND

ANY DEBRIS OR WASTE DISPOSAL SHOULD BE AT AN APPROPRIATELY AUTHORIZED

18. BEST MANAGEMENT PRACTICES SHALL BE USED TO CONTROL RUNOFF FROM CONSTRUCTION SITES TO PREVENT DETRIMENTAL IMPACT TO SURFACE AND GROUND



TESTING SCHEDULE

DESCRIPTION	RATE	QUANTITY
DENSITIES - SUBGRADE (DITCH BACKFILL)		
SOILS:		
STANDARD PROCTOR - SUBGRADE	PER STREET	1
DENSITIES - SUBGRADE (PAVEMENT)	PER 325 SY	1
DENSITIES - SUBGRADE (RCP)	PER RCP LOCATION, EACH	1
SIEVE ANALYSIS	PER 3000 CY	1
ATTERBURG LIMITS	PER 3000 CY	1
MODIFIED PROCTOR	PER 3000 CY	1
L.A. ABRASION CBR (STANDARD)	PER 3000 CY	1
DENSITIES OF COMPACTED BASE (PAVEMENT)	PER 325 SY	1
WET BALL MILL TEST	PER MATERIAL SOURCE	1
TRIAXIAL TEST	PER MATERIAL SOURCE	1
HOT-MIX ASPHALT CONCRETE (HMAC)		
EXTRACTION, SIEVE ANALYSIS	PER 500 TONS OR DAY	1
LAB DENSITY & STABILITY	PER 500 TONS OR DAY	1
	PER 500 TONS OR DAY	1
THICKNESS - IN PLACE (CORE)	PER 1000 LF	- 1
% AIR VOIDS - IN PLACE (CORE)	PER 1000 LF	1
% THEORETICAL DENSITY - IN PLACE (CORE)	PER 1000 LF	1
CONCRETE:		
(UNCONFINED COMPRESSION, 7, 14, & 28 DAY)		
	PER 4000 SF	1

NOTE: CONTRACTOR TO COORDINATE WITH ENGINEER FOR MATERIAL TESTING AND LOCATION.



CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D. AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS KINGSVILLE , KLEBERG COUNTY, TEXAS LEGENDS LEGENDS LEGENDS LEGENDS LEGENDS LEAR REGISTRATION #F - 10037	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	E BY DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION
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ESTIMATED QUANTITIES SUMMARY - TOTAL

LOW WATER CROSSING 3 (W. D AVE.)
DESCRIPTION

ITEM	DESCRIPTION	UNIT	QUANTITY
	BASE BID		
A1	MOBILIZATION / BONDS / INSURANCE	LS	1
A2	TRAFFIC CONTROL	LS	1
A3	UTILITY ADJUSTMENT	LS	1
A4	SWPPP (SEDIMENT CONTROL FENCE)	LF	30
A5	SWPPP (BALED HAY)	LF	15
A6	REMOVE EXISTING RAIL	LF	70
A7	REMOVE EXISTING DECK CONCRETE	SY	48
A8	REMOVE SECTION OF EXISTING CONCRETE RIP RAP	SY	10
A9	REMOVE EXISTING CONCRETE RIP RAP	SY	20
A10	REMOVE SECTION OF EXISTING 42"Ø RCP	LF	40
A11	REPAIR EXISTING DECK CONCRETE	SY	48
A12	CONCRETE RIP RAP	SY	240
A13	CONCRETE COLLAR	EA	5
A14	ROCK RIP RAP	SY	88
A15	REGRADE EXISTING TRANQUITAS CREEK	SY	158
A16	42"Ø RCP	LF	40
A17	RAIL	LF	70
A18	WATER GAUGE	EA	2
A19	REMOVE EXISTING WATER GAUGE	EA	1

NOTE:

1. THE ESTIMATED QUANTITIES LISTED ARE FOR INFORMATIONAL PURPOSES AND FOR CONTRACTOR REFERENCE. THE CONTRACTOR IS RESPONSIBLE FOR DELIVERING A FINISHED PROJECT AS DETAILED ON THE PLANS AND SPECIFICATIONS.

- 2. ALL COMPACTION AND MATERIAL TESTING SHALL BE SUBSIDIARY TO LINE ITEM.
- 3. TRENCH SAFETY, EXCAVATION, BACKFILL, AND COMPACTION ARE ALL
- SUBSIDIARY TO LINE ITEM.
- 4. UTILITY ADJUSTMENT SHALL INCLUDE ANY AND ALL UTILITIES NECESSARY FOR THE COMPLETION OF THIS PROJECT.
- ALL TIE-IN CONNECTIONS SHALL BE SUBSIDIARY TO LINE ITEM.
 ALL LANE STRIPING SHALL BE SUBSIDIARY TO STREET ASPHALT.

	CONSULTANT'S PROJECT NO.	SHEET
	JESUS JAVER JMENEZ	Sel on / to
DESCRIPTION		INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417 T.B.P.E. FIRM REGISTRATION #F - 10837
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	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	STORM WATER SECTION III
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PAVED AREAS

A. FOR 12" ABOVE PIPE TO 3' BELOW BOTTOM OF ROAD BASE: BACKFILL SHALL BE SELECT MATERIAL FROM EXCAVATION OR TO BE IMPORTED MATERIAL AND SHALL MEET THE

LOOSE LIFTS OF 10" MAX OR IF SELECT MATERIAL FROM EXCAVATION DOES NOT MEET REQUIREMENTS, THEN USE CEMENT STABILIZED

B. FOR 3' BELOW BOTTOM OF ROAD BASE TO

BACKFILL SHALL BE CEMENT STABILIZED SAND AND SHALL MEET THE FOLLOWING

100%
55-100
40-100
25-100
10-20
NP-10

2 SACKS CEMENT/C.Y. OF SAND.

COMPACT TO 95% OF D698. MOISTURE TO BE ADJUSTED TO (+/-2%) OF OPTIMUM.

		CONSULTANT'S PROJECT NO.	SHEET
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	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	STORM WATER DETAILS
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- 2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.
- 3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
- 4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
- 5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
- 6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
- 7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
- 8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
- 9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
- 10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
- 11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
- 12. The Engineer has the final decision on the location of all traffic control devices.
- 13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

- 1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.
- 2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

- 1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
- 2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL – SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

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		CONSULTANT'S PROJECT NO.	SHEET
	DESCRIPTION	LESUS JAVER JIMENEZ	INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417 T.B.P.E. FIRM REGISTRATION #F - 10837
	BY		
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SHEET 1 OF 12 Traffic Safety Division Standard ARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	TXDOT - BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS-BC(1)-21
$\begin{array}{c c} BC(1) - 21 \\ \hline bc-21.dgn & DN: TxDOT & CK: TxDOT & DW: TxDOT & CK: TxDOT \\ OT November 2002 & CONT & SECT & JOB & HIGHWAY \\ \end{array}$	DATE	DRAWING NO	Э.
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GENERAL NOTES FOR WORK ZONE SIGNS

- 1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Enginee Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to guide the traveling public safely through the work zone.
- 5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and Responsible Person. All changes must be documented in writing before being implemented. This can include doc
- the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon char The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZT signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommenda regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installat the Engineer can verify the correct procedures are being followed.
- 7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or crac damaged or marred reflective sheeting as directed by the Engineer/Inspector.
- 8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters an for identification shall be 1 inch.

9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6 The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary bo

- work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's regard to crashworthiness and duration of work requirements.
- a. Long-term stationary work that occupies a location more than 3 days.
- b. Intermediate—term stationary work that occupies a location more than one daylight period up to 3 days, more than one hour.
- c. Short-term stationary daytime work that occupies a location for more than 1 hour in a single daylight d. Short, duration – work that occupies a location up to 1 hour.
- e. Mobile work that moves continuously or intermittently (stopping for up to approximately 15 minutes.) SIGN MOUNTING HEIGHT
- 1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above t as shown for supplemental plaques mounted below other signs.
- 2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but the ground. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the wor appropriate Long-term/Intermediate sign height.
- 5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardle SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed SIGN SUBSTRATES

- 1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendation support that is being used. The CWZTCD lists each substrate that can be used on the different types and mode
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the spliv centers. The Engineer may approve other methods of splicing the sign face. REFLECTIVE SHEETING
- 1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirement
- for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white backgroun 3. Orange sheeting, meeting the requirements of DMS-8300 Type B or Type, C, shall berused for rigid signs SIGN LETTERS
- 1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from the sign message is not applicable. This technique may not be used for signs installed in the median of divide
- intersections where the sign may be seen from approaching traffic. 3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be
- covered when not required. 4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the
- 5. Burlap shall NOT be used to cover signs.
- 6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
- 7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

- 1. Where sign supports require the use of weights to keep from turning over, the use
- of sandbags with dry, cohesionless sand should be used. The sandbags will be tied shut to keep the sand from spilling and to maintain a
- constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted
- for use as sign support weights.
- 4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular
- impact. Rubber (such as tire inner tubes) shall NOT be used.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- 8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

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Difference Bondrike Signs (TURS) intervention intervention <t< td=""><td>LESUS JAVER JIMENEZ</td></t<>	LESUS JAVER JIMENEZ
the paved surface, except t no more than 2 feet above vikday or raised to ess of work duration. d by the Engineer. ons for the type of sign leis of sign supports. '' thick by 6'' wide, of the sign using wood ice and spaced at 6'' ts of DMS-8300 d. with orange backgrounds. the Federal Highway and numbers shall be of mr traffic 90 degrees when led highways or near any e removed or campletely s which will cover the le sign sheeting. SHEET 4 OF 12 Traffic Safety Division Standard	DESCRIPTION DESCRI
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e Engineer/Inspector shall angeable message signs (approve all m (PCMS).	essages used on portable	e		Phase 1: Conc	lition Lists			Phase 2: Pos	ssible Componer		
ssages on PCMS should (ht characters per word), DR " "AT " etc.	contain no mor not including s	e than 8 words (about f simple words such as "TC	our to),"				Action to Take/Effect on Travel Location					
ssages should consist of	a single phase	e, or two phases that	ha	Road/Lane/Ramp Closure List Other Conditi			ition List		List			
ernate. Inree-phase mess essage should convey a s alf	ingle thought,	and must be understood	by	FREEWAY CLOSED	FRONTAGE ROAD	ROADWORK XXX FT	ROAD REPAIRS	MERGE RIGHT	FORM X LINES	AT FM XXXX		
the word "EXIT" to refe T CLOSED." Do not use	r to an exit ro the term "RAM	amp on a freeway; i.e., P."		X MILE	CLOSED		XXXX FT		RIGHT			
ays use the route or inte ong with the number when	erstate designa preferring to c	tion (IH, US, SH, FM)		ROAD	SHOULDER	FLAGGER			USE	BEFORE		
in use, the bottom of inimum 7 feet above th	a stationary f ne roadway, wh	PCMS message panel sho ere possible.	uld be	AT SH XXX	XXX FT		XXXX FT	X EXITS	RD EXIT	CROSSING		
message term "WEEKEN t on Saturday morning o	D" should be ι and end by Su	used only if the work is nday evening at midnight	to	ROAD	RIGHT LN	RIGHT LN	TWO-WAY	USE	USE EXIT	NEXT		
Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.			FM XXXX	XXX FT	XXXX FT	XX MILE	EXII XXX	NORTH	MILES			
ngineer/Inspector may or displaying a two-p	select one of hase message	two options which are a on a PCMS. Each phase	vail— may be	RIGHT X	RIGHT X	MERGING	CONST	STAY ON	USE	PAST		
ed for either four sec "flash" messages or	conds each or words include	for three seconds each. d in a message. The mes	ssage	LANES CLOSED	LANES OPEN	TRAFFIC XXXX FT	TRAFFIC XXX FT	US XXX SOUTH	I-XX E TO I-XX N	US XXX EXIT		
e steady burn or c present redundant ir	ontinuous while nformation on d	e displayed. a two—phase message; i.e	e.,	CFNTFR	DAYTIME		UNFVFN	TRUCKS	WATCH			
two lines of the me use the word "Dang	essage the sam er" in message	ne and changing the third 	d line.			GRAVEL			FOR			
display the message 'CMS. Drivers do no	"LANES SHIFT t understand th	LEFT" or "LANES SHIFT F ne message.	RIGHT"									
t display messages th ice of the sign.	at scroll horizc	ontally or vertically across		LANE	EXIT	X MILE	ROAD	FOR	DELAYS			
owing table lists abb ceptable for use on a	reviated words a PCMS. Both	ana two-word phrases th words in a phrase must	nat be		CLOSED		XXXX FT			FM XXXX		
yea together. Words or viated, unless shown in	n the TMUTCD.	18 inches for the law	e	VARIOUS LANES	EXIT XXX CLOSED	ROADWORK PAST	ROADWORK NEXT	EXPECT DELAYS	PREPARE TO			
They should be visible	e from at least	10 inches for trailer molecular $1/2$ (.5) mile and the	text	CLOSED	X MILE	SH XXXX	FRI-SUN		STOP			
ht. Truck mounted ur nust be legible from c	nits must have It least 400 fe	a character height of 1(et.) inches	EXIT CLOSED	RIGHT LN TO BE	BUMP XXXX FT	US XXX FXIT	REDUCE	END SHOULDER			
ine of text should be right justified.	centered on t	he message board rather	than		CLOSED		X MILES	XXX FT	USE			
abled, the PCMS should larm motorists and wil	d default to an I only be used	illegible display that will to alert workers that th	e	MALL	X LANES	TRAFFIC	LANES	USE	WATCH			
is appropriate.	pattern such o	as a series of horizontal	SOlid	CLOSED	TUE – FRI	XXXX FT	*	ROUTES	WORKERS			
		1		XXXXXXXX				STAY				
RD OR PHRASE A	BBREVIATION	WORD OR PHRASE	ABBREVIATION	CLOSED	st LANES SHIFT in Phase	1 must be used with STA	AY IN LANE in Phase 2.	LANE *	<	* * _S ,		
ernate ACC	CS RD	Major N Miles	MAJ MI									
e Al Route BE	/E EST_RTE	Miles Per Hour Minor	MPH MNR		APPLICATION GUIDELINES			WORDING ALTER	NATIVES			
e Bl	<u>_VD</u> RDG	Monday Normal	MON NORM		1. Only 1 or 2 phases are to 2. The 1st phase (or both) sh	be used on a PCMS. Jould be selected from the		1. The words RIGHT 2. Roadway designa	, LEFT and ALL can be interch tions IH US SH FM and LP c	anged as appropriate.		
er CA	ANT FR	North Northbound	N (route) N		"Road/Lane/Ramp Closure L	List" and the "Other Condition	n List". /Effect	appropriate.	TH and SOUTH (or abbreviation	$a_{\rm S} \in W$ N and S) can		
uction CC	ONST AHD	Parking Road	PKING RD		on Travel, Location, General	Warning, or Advance Notice		be interchanged	as appropriate.			
G XI Route Dr	NG TOUR RTF	Right Lane	RT_LN		4. A Location Phase is necessor	ary only if a distance or loca	ation	5. ROAD, HIGHWAY	and furnibers replaced as appro and FREEWAY can be interchand	ged as needed.		
t D(DNT	Service Road	SERV RD		5. If two PCMS are used in se	priase selected. equence, they must be separe	rated by	6. AHEAD may be u 7. FT and MI, MILE	isea instead of distances if ne and MILES interchanged as ap	cessary. propriate.		
bound (r	route) E	Slippery	SLIP		a minimum of 1000 ft. Eac and should be understandab	ch PCMS shall be limited to to be the shall be shall be themselves.	two phases,	8. AT, BEFORE and 9. Distances or AHF	PAST interchanged as needed. AD can be eliminated from the	e message if a		
ency EN ency Vehicle EN	NER VEH	South Southbound	S (route) S		6. For advance notice, when the	he current date is within seven needar days should be replace	ren days ced with	location phase is	s used.	-		
ance, Enter EN	NT	Speed Street	SPD ST		days of the week. Advance	notification should typically b	be for					
pressway EX	(PWY	Sunday	SUN		no more tnan one week pri	IOT LO THE WORK.						
Ahead XX	DG AHD	Telephone Temporary	PHONE TEMP									
Nay Fr	RWY, FWY	Thursday			PCM	IS SIGNS WITHIN THE	, K.U.W. SHALL BE BEHIN	ND GUARDRAIL UR				
ay Ff		Traffic	TRAF		(UUNUKELE BAKKIEK (DIACTIA DOLINAS DIAA	OR SHALL HAVE A MINIM	UNI UF FUUK (4) TRAFFIC ON TUF				
rdous Driving HA rdous Material HA	AZ DRIVING AZMAT	Travelers	TRVLRS		[]	IPSTREAM SIDE OF TH	HE PCMS. WHEN EXPOSE	ED TO ONE DIRECTION	N			
Decupancy H()V	Time Minutes	TIME MIN		OF	TRAFFIC. WHEN FXF	POSED TO TWO WAY TRAF	FFIC, THE FOUR DRU	MS			
е НV	VY	Upper Level	UPR LEVEL	SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.								
HF	R, HRS	Warning	WARN					·····2···3 •• •				
	TS	Wednesday Weight Limit	WED	FULL MATRIX PCMS SI	GNS							
tion IN	· -			1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE"								
	СТ Т		W	CHANGEABLE MESSAGE SIGNS" above.								
11 ion IN IT n J(LF ne LF	T T LN	- West Westbound Wet Pavement	(route) W WET PVMT	CHANGEABLE MESSAGE SI 2. When symbol signs, such	GNS" above. as the "Flagger Symbol"(CW20	0-7) are represented araphic	cally on the Full Matrix PCMS sign	and, with the approval of th	ne Engineer, it			
antion IN IT on J(ane LF losed LN	T T LN CLOSED /R LEVEL	West Westbound Wet Pavement Will Not	W (route) W WET PVMT WONT	CHANGEABLE MESSAGE SI 2. When symbol signs, such shall maintain the legibili	GNS" above. as the "Flagger Symbol"(CW20 ty/visibility requirement listed ab	0—7) are represented graphic pove.	cally on the Full Matrix PCMS sign	and, with the approval of th	ne Engineer, it	FILE		

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

List	Other Conditio	n List
TAGE AD SED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ILDER SED FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
T LN SED FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
IT X IES EN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
TIME NE URES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
SOUTH (IT SED	DETOUR X MILE	ROUGH ROAD XXXX FT
XXX SED /IILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
T LN BE SED	BUMP XXXX FT	US XXX EXIT X MILES
ANES SED – FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

HFT	in	Phase	1	must	he	used	with	STAY	IN	IANE	in	Phase	2
		1 11000		mase		uocu	WICH	01/11	11.4			1 11000	<u> </u>

	THUSE Z. I	ossible compo
Action to Tak	e/Effect on Travel List	Location List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX
EXPECT DELAYS	PREPARE TO STOP	
REDUCE SPEED XXX FT	END SHOULDER USE	
USE OTHER ROUTES	WATCH FOR WORKERS	
STAY IN		*

GENERAL NOTES	
1. For long term stationary work zones on freeways, drums shall be used as	Handle ————————————————————————————————————
 For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the 	Top should not allow collection of water or debris 4" max \$
 3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer. 4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" 	4" min 8" max (typ) 2" max
 (CWZTCD). 5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely 	.E
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replace- ment device must be an approved device.	42"
GENERAL DESIGN REQUIREMENTS	
 Pre-qualified plastic drums shall meet the following requirements: 1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom. 2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to permal. 	
 and/or air turbulence created by passing vehicles. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports. 	<u>_</u>
 4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches. 5. The ten of the drum shall have a built in handle for easy pickup and 	
shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.	
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.	36"
 Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material. 	No.
9. Drum body shall have a maximum unballasted weight of 11 lbs. 10.Drum and base shall be marked with manufacturer's name and model number.	
RETROREFLECTIVE SHEETING	Detectable Ed
 The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans. 	
 The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface. 	DETECTABLE 1. When existing relocated in detectable and the features
BALLAST	to WZ(BTS-2 Diversions. S
 Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches. 	2. Where pedest closed sidew placed acros of a Type 3 above, longit barriers, and detectable ec path.4. Tape.
 Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base. Recycled truck tire sidewalls may be used for ballast on drums approved. 	detectable, d "Americans v (ADAAG)" and movements.5
for this type of ballast on the CWZTCD list.	barricades.

- 4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- 5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- 6. Ballast shall not be placed on top of drums.
- 7. Adhesives may be used to secure base of drums to pavement.

		CONSULTANT'S PROJECT NO.	SHEET
18" x 24" Sign laximum Sign Dimension) W1-8, Opposing Traffic Lane eway sign D70a, Keep Right 	DESCRIPTION	ACCESSION AND AND AND AND AND AND AND AND AND AN	INATIONAL CONSULTING ENGINEERS 26.5805 261 SARATOGA BLVD. 5806 CORPUS CHRISTI, TX 78417 .: FIRM REGISTRATION #F - 10837
, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS			INTE PHONE: 361.826 FAX: 361.826 T.B.P.
used on plastic drums shall be manufactured using rates listed on the CWZTCD. rons and other work zone signs with an orange background be manufactured with Type B or Fype C Orang _{&L} ing meeting the color and retroreflectivity requirements MS-8300, "Sign Face Material," unless otherwise fied in the plans	NO. DATE BY	CITY CITY CITY	A A A A A A A A A A A A A A A A A A A
al Panels shall be manufactured with orange and white ing meeting the requirements of DMS-8300 Type A or Type B. mal stripes on Vertical Panels shall slope down toward ntended traveled lane.	REVISION	(
sign messages (text or symbolic) may be used as wed by the Engineer. Sign dimensions shall not exceed ches in width or 24 inches in height, except for the R9 signs discussed in note 8 below. shall be installed using a 1/2 inch bolt (nominal) nut, two washers, and one locking washer for each action. sing bolts and nuts shall be fully engaged and uately torqued. Bolts should not extend more than 1/2 beyond nuts. ons may be placed on drums on the outside of curves, erging tapers or on shifting tapers. When used in these ons, they may be placed on every drum or spaced not than on every third drum. A minimum of three (3) d be used at each location called for in the plans. , R9–10, R9–11 and R9–11a Sidewalk Closed signs which the inches wide may be mounted on plastic drums, with val of the Engineer. SHEET 8 OF 12 Traffic Safety Division standard BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES BC(8)–21	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE KINGSVILLE , KLEBERG COUNTY, TEXAS	TXDOT - BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES-BC(8)-21
FILE: bc-21.dgn DN: TxDOT CK: TxDOT DW: TxDOT CK: TxDOT DIST COUNTY SHEET NO. CCU TT CCU CU CU	EVISION NO. DATE	DRAWING NO C2 SHEET 24	D. 23 of 29
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								CONSULTANT'S PROJECT NO.	SHEET
vices illustrated on this sheet may be installed "ic and are suitable for use on high or low neer/Inspector shall ensure that spacing and in accordance with the "Texas Manual on Uniform "MUTCD). In on this sheet may have a driveable, fixed or ement for self-righting channelizing devices must al Notes or other plan sheets.							A LEGUES ANTER JACK		
all notes of other plan sheets. elf-righting supports should be used in work zone devices are frequently impacted by errant vehicles usts making alignment of the channelizing devices tions of these devices shall be detailed else- e devices shall conform to the TMUTCD and the ffic Control Devices List" (CWZTCD). ain devices in a clean condition and replace aded, or broken devices and bases as required by the Contractor shall be required to maintain proper ment. bricated from virgin and/or recycled rubber. The n a minimum of 30 lbs. e prepared in a manner that ensures proper bonding e fixed mount bases and the pavement surface. ed and applied according to the manufacturer's all of channelizing devices shall not cause final pavement surfaces, including pavement urface integrity. Driveable bases shall not be ent surfaces. The Engineer/Inspector shall approve						DESCRIPTION		INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417 T.B.P.E. FIRM REGISTRATION #F - 10837	
	edures of fi		es.				BY		S A A A A
osted peed	Formula	D Tape	Minimum esirable er Lengt * *	hs	Suggested Spacir Channel Dev	Maximum ng of lizing vices	NO. DATE	CITY	
7.0		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	SION N		
30 35	$L = \frac{WS^2}{CO}$	150 205'	165 225'	245'	30	70'	REVI		
40 45 50 55 60 65 70 75	L=WS	265' 450' 550' 600' 650' 700' 750'	295' 495' 550' 605' 660' 715' 770' 825'	320' 540' 600' 660' 720' 780' 840' 900'	40' 45' 50' 55' 60' 65' 70' 75'	80' 90' 100' 110' 120' 130' 140' 150'		NG 3 (W. D AVE.)	(UCTION)-21
80 800' 880' 960' 80' 160' ** Taper lengths have been rounded off. L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH) SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS							DESCRIPTION	V WATER CROSSI KLEBERG COUNTY, TEXAS	ADE AND CONSTR NG DEVICES-BC(
Te BAR	kas Depa RICAD CHAN	SHE Artment	et 9 of Tra ND	of 1: nsporta CON G D	2 ation STRU EVICE	Traffic Safety Division Standard		Y OF KINGSVILLE LOV KINGSVILLE ,	TXDOT - BARRIC/ CHANNELIZI
I I	oc-21.dgn November 200	BC 02	DN: Tx CONT	<u>— 2</u> 201 ск. 1 SECT	TxDOT dw: 1 job l	ГхДОТ СК: ТхДОТ НІСНЖАЧ	BY	CLU	
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		PROJECT NO.		
tivities have occurred		LEOUS JAMER JMENEZ		
g linear soil impressions /2" to 2" in depth.	RIPTION		17	
length impressions are	DESCE		INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 784. T.B.P.E. FIRM REGISTRATION #F - 10837	
	B			
Linear soil impressions.	0. DATE			
	EVISION N		z	
Desida	DESCRIPTION	SVILLE LOW WATER CROSSING 3 (W. D AVE.) KINGSVILLE , KLEBERG COUNTY, TEXAS	RY EROSION, SEDIMENT AND WATER POLLUTIC SURES FENCE & VERTICAL TRACKING-EC(1)-16	
DesignTexas Department of TransportationStandard		NGS	JRAR /EAS	
TEMPORARY EROSION, SEDIMENT AND WATER OLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING	BY	СІТҮ ОҒ К	DOT-TEMP(CONTROL N	
EC(1) - 16			TX ,	
ec116 DN: TxDOT CK: KM DW: VP DN/CK: LS DOT: JULY 2016 CONT SECT JOB HIGHWAY REVISIONS Image: Construction of the sect of the s	 DATE	DRAWING NO).	
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	REVISIO	SHEET 27	_ of	

		CONSULTANT'S PROJECT NO.	; SHEET
Wire, nylon or polypropylene binding Flow Flow SECTION B-B Fill voids between bales with hay 3% " Dia. rebar or 2" x 2" wood stakes	DESCRIPTION	LESUS JANER JINENEZ	INTERNATIONAL CONSULTING ENGINEERS PHONE: 361.826.5805 261 SARATOGA BLVD. FAX: 361.826.5806 CORPUS CHRISTI, TX 78417
	DN NO. DATE BY	CITY CITY	Source
FOR EROSION CONTROL	REVISIC		NOI
BH a minimum of 30" in length and weigh bound by either wire or nylon or g. The bales shall be composed entirely r. embedded in the soil a minimum of 4" and he height of the bale. placed in a row with ends tightly abutting The bales shall be placed with bindings und. securely anchored in place with $\frac{3}{6}$ " Dia. be angled towards the previously the bales together. In hereon are suggestions only and may be ineer. Texas Department of Transportation Design Division Standard TEMPORARY EROSION , SEDIMENT AND WATER SEDIMENT AND WATER SEDIM	BY DESCRIPTION	CITY OF KINGSVILLE LOW WATER CROSSING 3 (W. D AVE KINGSVILLE , KLEBERG COUNTY, TEXAS	TXDOT-TEMPORARY EROSION, SEDIMENT AND WATER POLLI CONTROL MEASURES FENCE & BALED HAY-EC(1)-09
EC(1)-09ec109.dgnDN: TxDOTCK: AMDW: TVCK: BDDOTJune 1993CONTSECTJOBHIGHWAY	DATE	DRAWING N	0.
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